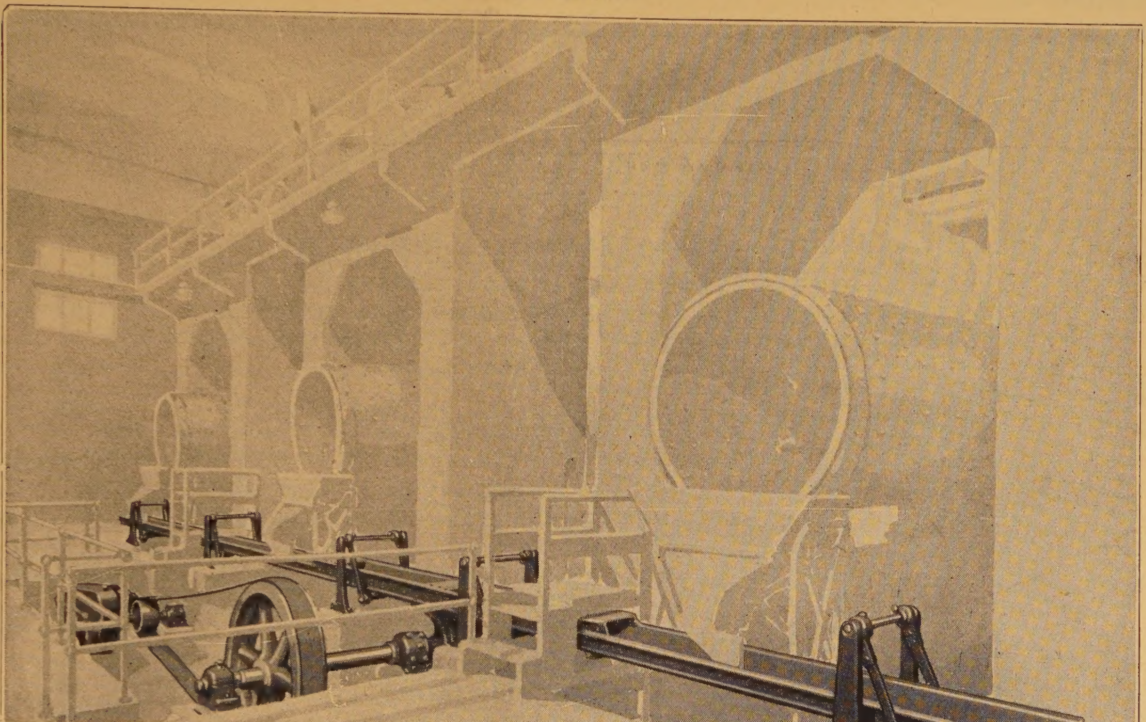
CEMENT MILL SECTION of

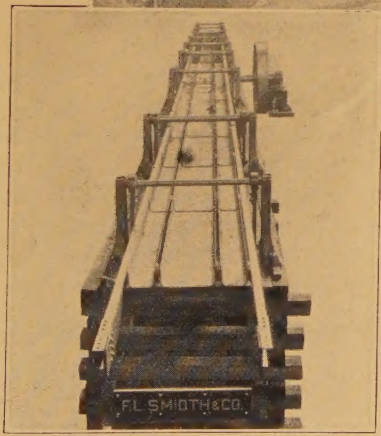
Concrete

THE SKIPULTER

(Trade Mark Reg.)



A Skipulter installed in a western cement plant, where it is conveying cement clinker, discharged from three coolers, to an elevator



Triplex Skipulter for conveying three different materials between the same or different stations

THE Skipulter is an improved type of shaker conveyor for transporting coarse materials, such as cement clinker, coal, ore, slag, rock, limestone, etc.

It consists of a steel trough, suspended by pendulums, actuated through a flywheel and eccentric into an intermittent forward and backward motion. No springs or rollers are employed. The transported material is rapidly and constantly carried forward to point of discharge.

The Skipulter can be arranged to receive different materials at different feed points at the same time, either mixing them or keeping them separated during the transport as desired. And, the discharge can be arranged at either end of the trough or at various intermediate stations as required.

This type of conveyor is one of the simplest means of conveying materials, economical to operate, requiring very little horsepower, and is a simple solution to many conveying problems.

F. L. SMIDTH & COMPANY

Engineers

225 Broadway New York, N. Y.

CEMENT MILL SECTION of

Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of portland cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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Rapid Volumetric Determination of Magnesium in Portland Cement

May Complete Single Determination in 30 Minutes—Accuracy Shown in Close Agreement with Gravimetric Determination

By FRED P. DIENER
Assistant Chief Chemist, Northampton Plant,
Universal Atlas Cement Co., Northampton, Pa.

The Diener method for the rapid determination of the magnesium content in portland cement constitutes an important advance in plant laboratory procedure. The method, which is of recent development, is published for the first time in this exclusive article.

Under older methods employed for the determination of magnesium it is often necessary to hold cement shipments for 24 hours or more while the cars are sampled and the tests are made. Under this new method a single determination may be completed in 30 minutes after the chemist has familiarized himself with the procedure.

Full credit is due the officials of the Universal Atlas Cement Co. for their fine spirit of co-operation in permitting Mr. Diener to release the details of this procedure for the benefit of the industry.—The Editors.

IN most cement laboratories a source of considerable annoyance has been the length of time necessary to make a complete analysis of cement, the common procedure requiring two or three days. The determinations which are the largest time consumers are those of silicon and magnesium. The former requires a double evaporation, and often a treatment with hydrofluoric acid for very accurate results, while the latter determination can not be made until the silicon, iron, aluminum, manganese and calcium have been removed, and then the solution requires long standing for complete precipitation.

Some Methods Previously Developed

Rapid methods have been devised for determination of silicon by dehydration with perchloric acid, and most laboratories employ some rapid method for determination of calcium whereby calcium oxalate is precipitated in the presence of oxalic or acetic acids. The rapid determination of magnesium has proved more or less of a stumbling block. Several excellent methods have been worked out for that determination in the filtrate after the silicon, iron, aluminum, and calcium separations, notably the method of Redmond and Bright,[1] whereby the magnesium is precipitated with 8-hydroxyquinoline and subsequently titrated with standard potassium bromate-bromide and sodium thiosulphate solutions. Pool[2] employs the same filtrate, and after boiling with sodium hydroxide to remove ammonium salts, neutralizes the solution and precipitates the magnesium as hydroxide with standard NaOH solution, titrating the excess alkali with standard acid solution.

The Standard Specification for Portland Cement (C9-30) of the A.S.T.M. limits the magnesium content to 5.00 per cent MgO (plus a tolerance of 0.4 per cent), but does not include limits for silicon, iron, aluminum, or calcium. For this reason it was felt that a rapid method for the determination of magnesium should be devised, which did not involve the separation of these other elements in the usual rather lengthy manner. The method of Pierce and Geiger[3] furnished some valuable leads on the separation of iron and aluminum from magnesium by properly controlling the *pH* value of the solution, and the method devised is in some respects a modification of their method.

THEORY OF THE METHOD

When a slightly acid solution of the sample is treated with an excess of calcium carbonate, the solution acquires a *pH* value of approximately 7.4.[4] Since ferric ions[5] are precipitated as hydroxide at $pH = 3$, aluminum[5] at $pH = 5$, bivalent manganese[5] at $pH = 9$, and magnesium[5] at $pH = 11$, the iron and aluminum will be precipitated and the manganese and magnesium remain in solution. Manganese may be conveniently removed by addition of a slight excess of potassium permanganate solution to the boiling solution, whereby the manganese is oxidized to MnO_2, and the permanganate itself reduced to MnO_2. The excess permanganate is reduced by boiling with a small amount of ethyl alcohol. Following this separation the magnesium is precipitated with a standard carbonate-free alkali solution and the excess alkali titrated with standard acid solution. Due to the large amounts of calcium in solution, a large excess of alkali should be avoided to prevent separation of calcium hydroxide, and as a guide trinitrobenzene indicator is employed which changes color above $pH = 11$, or after the magnesium has been precipitated. For the back titration with acid, phenolphthalein indicator may be employed.

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[1] J. C. Redmond and H. A. Bright—Research Paper No. 265—*B. of S. Jr. of Research*, Vol. 6, Jan., 1931. (CONCRETE, Cement Mill Edition, July, 1931, p. 65.)

[2] Arthur J. Pool—*Rock Products*, Vol. 33, No. 17, Aug. 16, 1930.

[3] J. Stanton Pierce and M. B. Geiger—*Ind. and Eng. Chem.*, Anal. Ed., 2, 193 (1930).

[4] E. Wichers—*Jr. Am. Chem. Soc.*, 46, 1826 (1924).

[5] H. T. S. Britton—*J. Chem. Soc.*, 127,^{2} 2157 (1925).

PROCEDURE IN DETAIL

To 4.0 grams of cement in a 400-ml. beaker add about 50 ml. of water and stir to mix the two. Add 30-40 ml. of 1-1 HCl and 15 drops of concentrated nitric acid, and dilute to about 250 ml. with water. Boil until the cement is completely in solution, excepting possibly some silica which may separate out. While the solution is boiling vigorously, add strong sodium hydroxide solution from a pipette, stirring vigorously to prevent the precipitate from forming in large lumps. Then continuing the boiling and stirring, add 1-1 HCl from a pipette until the solution is slightly acid, as noted when the solution assumes a yellow ferric chloride color. Avoid much excess acid. Continue the boiling a minute to make certain the precipitated material has been entirely dissolved (excepting some silica) and then remove the beaker from the burner.

Cautiously add calcium carbonate to the solution until the acid has been neutralized and then add a gram or two in excess. The carbonate is best added in the form of a thick suspension in water. Boil the solution vigorously for a minute or two, and then add a dilute solution of potassium permanganate (4 grams per liter) from a burette or pipette until the supernatant liquid has a very slight pink color. Avoid much excess. Boil the solution for a minute longer, add 2.0 ml. of ethyl alcohol, and continue the boiling for about two minutes. Transfer the contents of the beaker to a 300-ml. volumetric flask, cool, dilute to the mark, and filter through a dry paper.

After discarding the first 10 or 20 ml., transfer 150 ml. of the filtrate to a 500-ml. Erlenmeyer flask. Heat to boiling and add 1.5 ml. of a saturated solution of 1:3:5 trinitrobenzene in ethyl alcohol (about 2 grams per 100 ml. of alcohol). Then add N/3 carbonate-free NaOH solution, 1 ml. at a time, with intermittent boiling for a few seconds, until the first faint pink color persists on boiling. Add 1 ml. more alkali solution and boil for about 30 seconds. Record the total amount of alkali used.

Transfer the solution to a 200-ml. volumetric flask, cool, dilute to the mark, and filter through a dry paper, discarding the first 10 or 20 ml. of filtrate. The filtrate must be perfectly clear, or else the end-point in the succeeding titration will be very indistinct. Transfer 100 ml. of the filtrate to a flask, add 1 ml. of phenolphthalein indicator (0.4 gram per 100 ml. of 50 per cent ethyl alcohol), and titrate to the disappearance of the pink color with N/3 nitric or hydrochloric acid solution. The ml. of alkali minus twice the ml. of acid represents the magnesium in a 2-gram sample.

NOTES

Enough standard alkali should be added to completely precipitate the magnesium without any precipitation of calcium. A guide to proper procedure is the amount of back titration with acid, which should be held between 1.0 and 2.0 ml. (after being doubled). A little experience with the color change of the trinitrobenzene indicator will enable the operator to hold the back titration between these limits.

Most commercial cements contain so little manganese that no appreciable error will be introduced by not removing it before precipitating the magnesium. In this case, boil the solution for three minutes after the addition of calcium carbonate, and transfer directly to the 300-ml. volumetric flask.

A blank determination should be made, using approximately the same amounts of reagents as specified in the regular method of analysis, and exercising particular care to get about the same amount of calcium carbonate in the solution. This blank is generally quite appreciable (amounting from 0.12 per cent to 0.17 per cent MgO) and, once determined for a particular batch of chemicals, should be subtracted from each determination made.

A good many cement laboratories use the acid-alkali method of raw mix control, or some modification of it. A convenient feature of this rapid magnesium method is that the same acid and alkali solutions may be used. However, it is important that the alkali solution be absolutely free of carbonate to avoid precipitation of calcium carbonate along with the magnesium hydroxide. This may be conveniently done by adding about 10-15 ml. of a freshly prepared, saturated barium hydroxide solution to each liter of alkali solution. After filtering off the precipitated barium carbonate, or siphoning off the clear supernatant solution, with as little exposure to air as possible, the solution is standardized by any of the accepted methods. The solution should be kept in a tubulature bottle fitted with an automatic burette, and the top of the bottle and the burette fitted with soda-lime tubes to protect it from the carbon dioxide in the air.

Two filtrations are involved in the method, but neither requires any washing of the precipitated material. With some experience the operator can easily complete a single determination in 30 minutes.

ACCURACY OF RESULTS

The results obtained by this method have been found to be in very close agreement with those obtained by the gravimetric method of precipitation as magnesium ammonium phosphate and ignition to pyrophosphate, as specified by the A.S.T.M. (C9-30). The table below shows results on a number of commercial cements of varying magnesium content. Samples 1 to 10, inclusive, contain MnO under 0.10 per cent, and the rapid determination of magnesium was made without the removal of manganese. Samples A, B, and C contain approximately 0.6 per cent MnO, and the manganese was removed, as directed, before the precipitation of magnesium with standard alkali solution.

Sample number	Gravimetric per cent MgO	Volumetric per cent MgO
1	3.08	3.08
2	2.81	2.85
3	3.20	3.21
4	3.24	3.28
5	0.94	0.90
6	0.98	0.97
7	3.65	3.64
8	2.51	2.61
9	1.23	1.22
10	1.10	1.07
A	1.86	1.88
B	1.95	1.92
C	2.35	2.34

Automatic Kiln Feed Control System Creates Uniform Clinker

Magnetic Clutch Supplies Automatic Feature—Feeder Stopped for Predetermined Periods, But Motor Runs Continuously—Signaling System Gives Warning

A KILN feed control system that regulates the rate of the slurry feed to six rotary kilns in the plant of the Superior Portland Cement, Inc., at Concrete, Washington, is a comparative newcomer in the cement mill field. The success of the installation at the Superior plant, however, promises well for the greater utilization of this kiln feed control system in cement mills, and, in consequence, a more uniform clinker.

Figure 1 shows a clear view of the installation, and Figure 2 is a diagrammatic layout of the system. The features shown in the halftone illustration (Figure 1) are also shown diagrammatically in the upper part of Figure 2.

Figure 3 is a close view of the interior of this type of feed control switch (shown also at the left edge of Figure 1), while Figure 4 illustrates the same switch, known as the Bendy feed control switch, mounted on the kiln drive in the installation at the Superior plant.

Principle of Operation

A thorough understanding of this interesting mechanism can be gained most readily from a detailed description.

A magnetic clutch was inserted in the drive of the slurry feeder.[1] The clutch is periodically engaged and disengaged so that the feeder makes a certain number of turns, and then stops until the kiln has completed a predetermined number of revolutions.

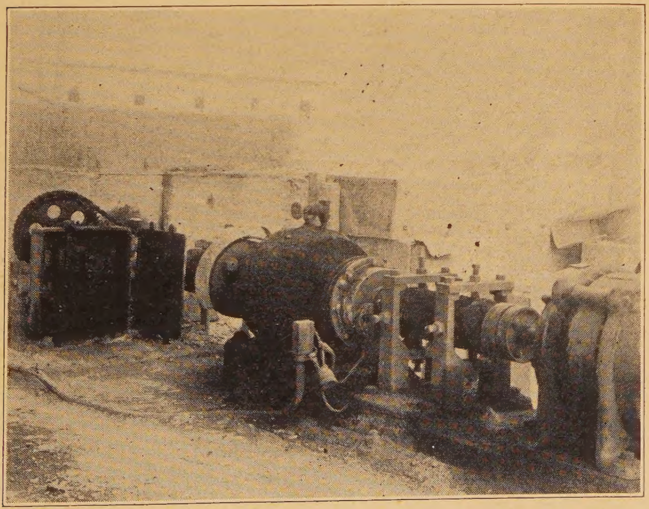

Figure 1. Feeder control box and magnetic clutch of kiln feed control system

For example, the highest speed of a kiln may be 1 r.p.m., and the conditions may be such that the feeder will be required to make 11 revolutions for each revolution of the kiln, although the maximum speed of the feeder may be 12 r.p.m. If the periodic cycle of the system is 2 minutes at the maximum kiln speed, then the operation will be as shown in the table on the following page.

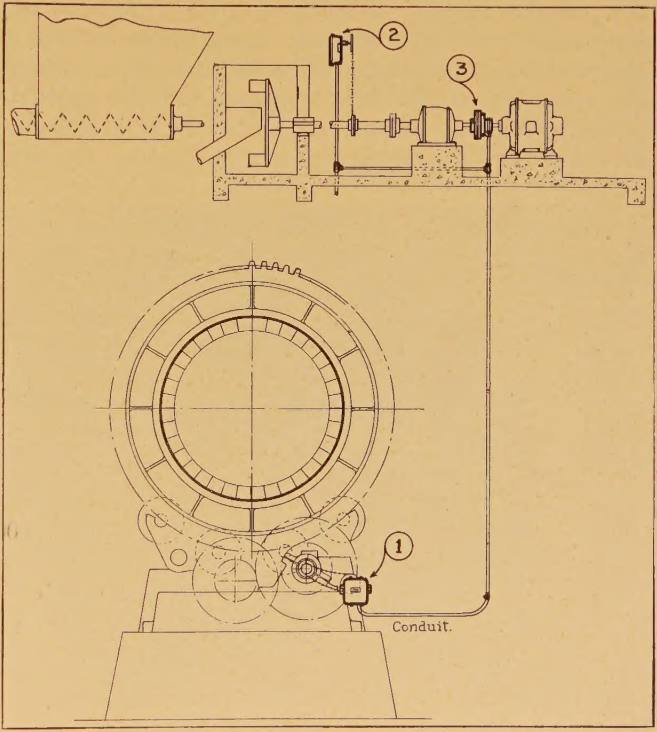

Figure 2. Diagrammatic layout of kiln feed control system. (1) Kiln control box; (2) Feeder control box; (3) Magnetic clutch

In the Superior installation the relation between the revolutions of the feeder and the kiln speed is not merely a close approximation, but is maintained with absolute accuracy.

Motor Runs Continuously

During the periodic stopping and starting of the feeder the motor that drives the feeder continues to run. This feature, of course, is made possible by the use of the magnetic clutch previously mentioned, a clutch of standard Cutler-Hammer manufacture. The use of the clutch

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[1] In a dry process plant the magnetic clutch is inserted in the drive of the dry raw feed screw.

OPERATION OF FEED CONTROL SYSTEM

	Relative speed of kiln, per cent				
	100	90	80	70	60
Time, in sec., required for 1 revolution of kiln	60	67	75	86	100
Time, in sec., required for 1 cycle	120	133	150	171	200
Time, in sec., for 22 turns of feeder	110	110	110	110	110
Time, in sec., during which feeder stops	10	23	40	61	90
Ratio of feeder revolutions to kiln revolutions	11.00	11.00	11.00	11.00	11.00

solves the many problems which would arise if the motor were stopped and started as frequently as is required by this system of feed control. Overheating of the motor, the probable necessity of using a special type of motor, the use of two 3-pole relays to interrupt the current in the two alternate circuits, the fly-wheel effect of the motor, the corroding of the relay contacts, and the probable necessity of using two automatic starters to avoid throwing the motor directly across the line, are some of the difficulties that are avoided by allowing the motor to operate continuously on an independent circuit and connecting it to the feeder by a magnetic clutch.

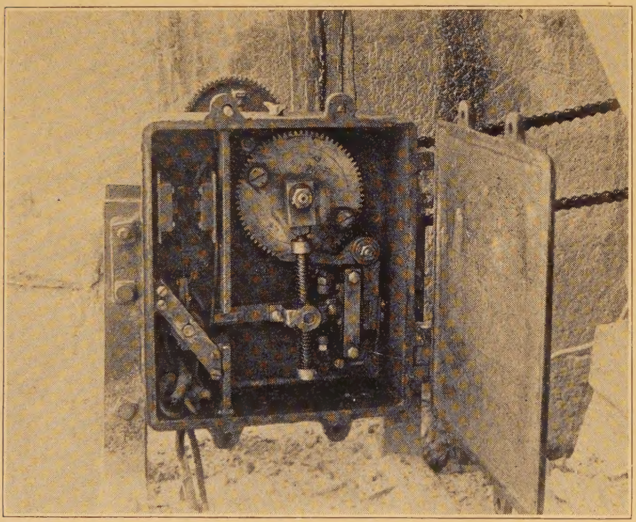

Figure 3. Interior of feeder control box in Superior plant installation

Design and Operation of Clutch

The magnetic clutch is designed to transmit a certain torque which is a function of the pull of magnets and of the coefficient of friction of the clutch lining on the clutch disc.

In the operation of this installation the kiln control box engages the clutch once for every two turns of the kiln; the feeder control box disengages the clutch after the feeder has made 22 turns. The net result is that the feeder makes 22 turns at a constant speed, and then stops, thereafter remaining at rest until the kiln has completed two turns.

The Control Boxes

The control boxes are in reality single-pole, 2-way, quick-acting switches, in which a central movable contact moves instantaneously from one to the other of two fixed contacts. The throw-over motion is actuated by a shaft which is driven from the feeder of the kiln. The mechanism is designed so that no intermediate position is possible; the moving contact is against either one or the other of the two fixed contacts. It snaps over from one to the other under the impulse of a compressed spring, even though the feeder stops at the precise moment of the release.

Arrangement of Control Boxes and Clutch

Returning again to Figure 2, this diagram shows the arrangement of the control boxes and the magnetic clutch. The feeder control box is driven mechanically from the feeder shaft. The kiln control box is driven from the end of the master pinion shaft, though it might be driven from other parts of the kiln-driving mechanism if the end of the master pinion shaft were not accessible.

The fixed contacts on the control boxes are paired off and connected to form alternate circuits. One d.c. line is connected to one brush of the clutch, while the other goes to the moving contact of the kiln control box. The second brush of the clutch is connected to the moving contact of the feeder control box. Thus the clutch can be energized through either one of two alternative circuits.

Continuous Cycle of Operation

By designating the two circuits just mentioned as A and B, and referring back to the table, a complete cycle of operation may be followed through. When the control switches are both on either line A or line B, the clutch will be energized; when they are on different lines the clutch will be disengaged. Since both switches must be on either one or the other of the two lines, the throwing over of either switch will change the conditions; that is, the state of being energized or dead will be reversed.

Assuming for the sake of the illustration that the kiln is running at 90 per cent of full speed (see table), then the following will be the cycles of operation:

First Cycle, Line A:

(1) Feeder stops 23 sec., with feeder control switch on line A, and kiln control switch on line B.

(2) Kiln switch throws over onto line A; feeder runs 110 sec., with feeder switch on line A, and the kiln switch on line A.

(3) Feeder switch throws over onto line B; feeder stops 23 sec., with feeder switch on line B, and kiln switch on line A.

Second Cycle, Line B:

(4) Kiln switch throws over onto line B; feeder runs 110 sec., with feeder switch on line B and kiln switch on line B.

(5) Feeder switch throws over onto line A; feeder stops 23 sec., with feeder switch on line A, and kiln switch on line B.

A continuous cycle of operation is thereby kept up, in which the kiln control switch starts the feeder after a certain number of turns of the kiln have been made (2 turns in this case), and the feeder runs for a certain number of turns (22 turns in this case) and is then stopped by the throwing over of the feeder control switch. The function of the kiln control switch is to start the feeder, while that of the feeder control switch is to stop it.

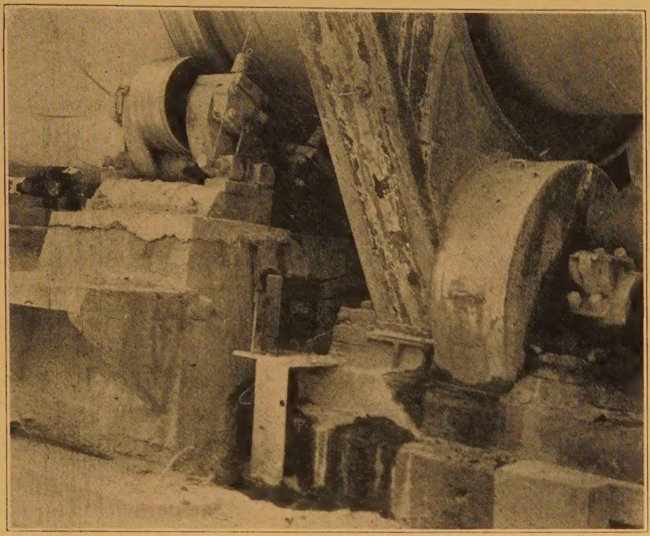

Figure 4. Feeder control switch mounted on kiln drive, at plant of Superior Portland Cement, Inc.

When the kiln stops at any time, the feeder makes a few turns, comes to a stop, and does not start again until the kiln is started once more.

Signaling System Gives Warning

A signaling circuit has been installed entirely distinct from the feed control circuit, the only connection being that the red and green signal lamps are controlled by the series relays in the alternate circuits of the feed control system. The signaling system can be disconnected without interfering in any way with the other wiring.

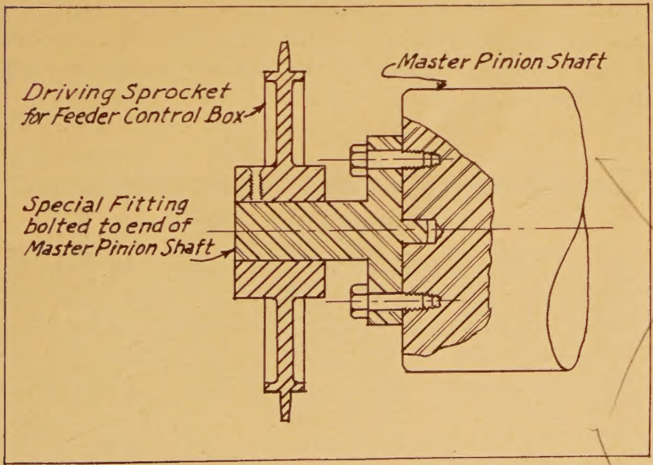
Master Pinion Shaft
Driving Sprocket for Feeder Control Box
Special Fitting bolted to end of Master Pinion Shaft

Figure 5. Driving sprocket attached to end of master pinion shaft

In the signaling system red and green lights are arranged so as to light alternately during the successive periods when the feeder is running, while both lights are off during the periods when the feeder stops. For instance, in the cases previously assumed, where the kiln is considered to be operating at 90 per cent of full speed (see table), the red light will be on for 110 seconds, then both lights are off 23 seconds, then the green light is on 110 seconds, then both are off 23 seconds, and so on. The burner watches the lights, and if this sequence is interrupted he knows that something has gone wrong with the mechanism or the wiring.

Figure 5 shows the manner in which the driving sprocket for the feeder control box is bolted to the end of the master pinion shaft in the kiln drive. This sprocket is designed for a $5/8$ by $3/8$-in. roller chain for driving the kiln control box. The driving sprocket attached to the shaft of the slurry feeder is a split sprocket, held in place by a split collar. This sprocket is also designed for a $5/8$ by $3/8$-in. roller chain, for driving the feeder control box.

Acknowledgments

The Bendy feed control system was developed by W. R. Bendy, now conservation engineer for the International Cement Corporation. During the period of the development of this system he served as field research assistant to H. A. Schaffer, then conservation engineer for the Portland Cement Association.

The manufacture and installation of the Bendy system has been taken over by the Manitowoc Engineering Works, Manitowoc, Wisconsin.

Governor Bilbo Proposes to Save Taxpayers $7,000,000 a Year

Declaring a state cement plant will save taxpayers between $6,000,000 and $7,000,000 annually in road building, Governor Bilbo of Mississippi on October 20 recommended the enactment of such legislation.

The principal object of the plant, Governor Bilbo is reported to have said, is to furnish cement for paving the 6,000 miles of highway authorized to be hard-surfaced by the Stansel law passed last season. The plan is to take $100,000 a year from the gasoline tax as a building fund for the plant.

"Satisfactory financing measures for the hard-surfaced program have not yet been worked out in the legislature, Governor Bilbo wanting a large bond issue, and House leaders wanting a 'pay as you go' plan, financed by a higher gasoline tax and increased privilege taxes on automobiles," according to the *Commercial Appeal* of Memphis, Tenn.

J. B. John Assures Reopening of Newago Plant in Spring

All necessary repairs will be made at the plant of the Newago Portland Cement Company and the mill will be placed in operation next spring, according to a statement issued by J. B. John, president of the Medusa company.

The statement was made in refutation of local rumors that the plant was to be shut down indefinitely.

Lehigh Earnings for Year Equal $2.35 on Preferred

The Lehigh Portland Cement Co. reports for the twelve months ended September 30 a net profit of $482,352 after depreciation, federal taxes, etc., equivalent to $2.35 a share (par $100) on 204,969 shares of 7 per cent preferred stock.

Illinois River Barge Shipments Declared Success

Marquette Expected to Resume Water Transportation from Oglesby Plant Next Spring

Last spring the Marquette Cement Manufacturing Co. extended the operation of its four bulk cement barges to the Illinois River, mainly for the purpose of transporting its product from the plant at Oglesby, Ill., to the company's cement storage terminal at St. Louis.

The barges had been in operation on the Mississippi River during 1929 and 1930, transporting cement from the Cape Girardeau plant to the cement storage terminals at Memphis and St. Louis. The extension of this service to the Illinois River was considered in the nature of an experiment.

The Illinois River operations have proved successful, both from the standpoint of cost and of physical operation, and in all probability will be continued next year, according to an article in the *Marseilles* (Ill.) *Press.*

The cement company closed its Illinois River operations out of Peru on October 16, the newspaper article continues, with the shipment of a barge tow containing 100 average railroad carloads of cement. The tow was destined for Memphis.

The operation out of Peru was begun on March 1 of this year and an average of three tows were moved out of that terminal each month to date. From June 1 on, the operation was supplemented by movements of cement via the Federal barge line, and an average of three tows per month moved out of the terminal via this barge line. In all, a total of 450,000 barrels was shipped out of the Peru terminal destined for down-river points such as St. Louis and Memphis. This quantity represents approximately 90,000 tons.

The experiment has proved successful and in all probability it will be resumed next year. In the event of continuation next year, better and more complete loading facilities will be provided at the Peru terminal.

After delivery of the four barges the towboat William Dickinson will return to its home port, Cape Girardeau, Mo., and will be engaged for the remainder of the season for the towing of coal for the plant at that point, from Chester, Ill.

Closing of the Marquette company's operation on the Illinois River at this time is made necessary by the closing of the two locks at La Grange and Kampsville. United States army engineers contemplate closing these locks for the purpose of making needed repairs and for installing new lock gates.

The combined capacity of the four Marquette bulk cement barges is 20,000 bbl., as stated in an article in the Cement Mill Edition of CONCRETE, April, 1931, pages 93-94.

Cement Section Elects New Officers and Members at Large

The officers and members of the executive committee of the Cement Section of the National Safety Council elected at the annual congress held at Chicago in October are as follows: W. L. White, Jr., general chairman; David Adam, vice-chairman; A. J. R. Curtis, secretary; Jack Dempster, News-Letter editor; A. R. Couchman, poster committee chairman; J. B. Zook, program committee chairman; H. A. Reninger, membership committee chairman; Frederick B. Hunt, engineering committee chairman, and Chas. P. Benner, W. W. Hamilton, and W. M. Powell, members at large.

Struckmann Anticipates Cement Mergers; Hopeful of South American Business

The cement industry shows signs of having turned the corner toward definite improvement, according to a statement in the New York Times of November 7, by Holger Struckmann, president of the International Cement Corp., upon his return from a three months' business trip to Europe and South America.

"The price of cement," he said, "is extremely low and any change should mean better prices."

"It is my opinion that as a result of the depression the cement industry will witness consolidations of stronger units and elimination of weaker ones. In any such move the International Cement Corporation will take an important part."

The company's foreign business, with the exception of that with Cuba, was being done at a profit, he declared. Its new plant at Rio de Janeiro, to be completed shortly, will have an annual capacity of 1,000,000 barrels.

"The future of International Cement in South America is so promising," he said, "that the company's income from this business alone should be ultimately sufficient to cover its dividend requirements. We are firmly established in Uruguay and the Argentine. As soon as the plant at Rio is completed we will commence construction of another unit at San Paulo. After many years' effort International has uncovered one of the finest limestone deposits in South America, which will enable the activities of our subsidiary companies to continue to develop uninterruptedly."

Big British Cement Firm Increases Earnings in 1930

By substantially expanding its turnover, the Francois Cementation Company increased its earnings materially in 1930. Including dividends from subsidiaries, trading profits are shown in the report just issued at £67,544 ($337,720), against £28,837 ($144,185) for 1929-30, a gain of £38,707, though the actual increase is not quite so large, because this time taxation is allowed for before striking the balance, instead of after, as previously. After being maintained at 50 per cent regularly for some years the common stock dividend was passed last year, though the preferred stock payment was made after transferring £15,000 from investment reserve.

As it is considered essential that resources should be conserved in order to build up larger reserves for the needs of the steadily expanding business and in view of the general unsettled outlook, the board is again withholding a common stock dividend. The forward balance has been raised from £38,209 to £44,330 ($191,045 to $221,650).

High-Efficiency Shaft Kiln Burns Clinker of Normal Quality

Briquetting of Raw Meal Eliminated—Capacity More Than Double That of Older Types—Mechanical Features of Kiln—Underburning Avoided

Economy in fuel consumption, reduced power requirements, and smaller plant space are among the advantages which have resulted in the return to the shaft kiln in some European cement plants recently built or reconstructed.

The modernization of this type of kiln has made this change possible. The present-day automatic rotary grate shaft kiln is a far cry from the older types of shaft kiln which originally were employed in cement manufacture in this country and abroad.

Figures 4 and 5 are taken from illustrations supplied by the manufacturer of the shaft kiln equipment installed in the new cement plant at Hausen, Switzerland, here described. These illustrations show the details of the equipment more clearly than would be possible with photographs of the actual installation.—The Editors.

ROTARY kilns and shaft kilns, the two kinds of cement-burning kilns, have for the most part been developed to the present state in the belief that the rotary kiln produces a cement of higher strength than the shaft kiln. It has been believed that with the advantages of the simple burning arrangement which the shaft kiln represents, the purchaser must accept the disadvantage of a product not so high in value.

Knowledge and Experience Necessary

Experience in practical construction and as much knowledge as possible of the burning procedure with properly equipped shaft kilns is necessary in the cement machinery industry, to make their production of a grade equal to that of the rotary kiln and to make safe construction possible. With the old mechanical shaft kilns many a difficulty was encountered, because of adhesion of the clinker to the kiln lining, lack of uniformity in the quality of the kiln output, and other troubles to be overcome, which affected the efficiency in an important manner.

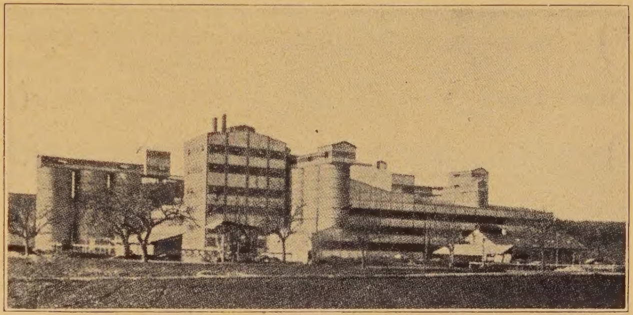

Figure 1. New plant of the Portland Zementwerke Hausen, A. G., at Hausen, Switzerland, has two modern type shaft kilns

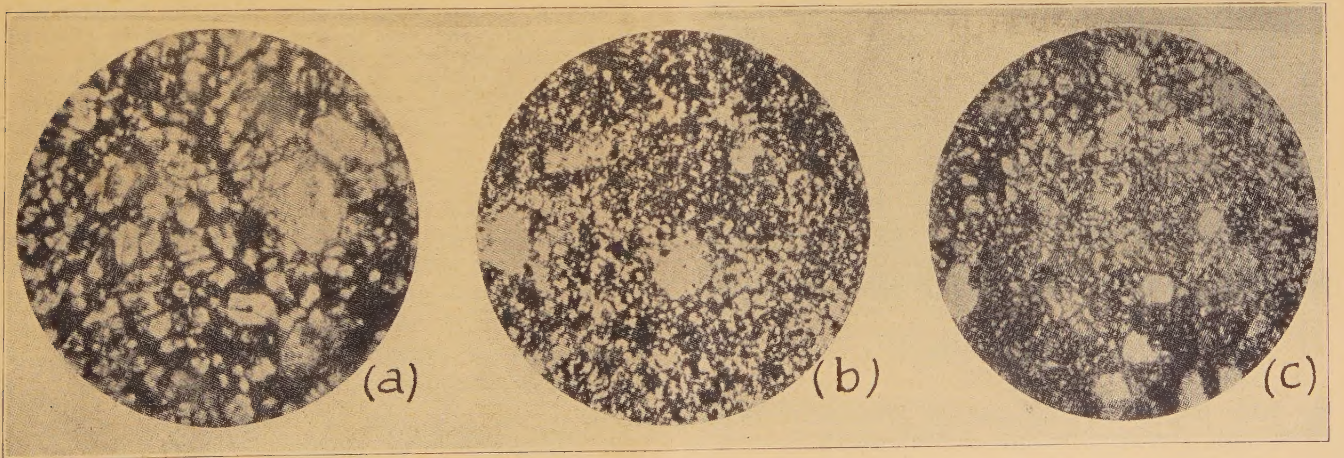

Figure 2. (a) Thin microscopic section from an old shaft kiln with briquetted raw meal. (b) Thin microscopic section from modern shaft kiln with unbriquetted raw meal. (c) Thin microscopic section of normal clinker from a rotary kiln

Older Shaft Kilns in America

The old types of shaft kiln are well known to the American portland cement industry. First came the dome kiln, which required the raw meal to be pressed into briquettes, after which the kiln was charged with alternate layers of briquettes and coke. After the clinker was drawn it had to be thoroughly sorted, and all overburned and underburned material was rejected. Only the properly burned clinker was ground.

Later on, several types of continuous shaft kilns were developed. In these kilns the charging was carried on continuously at the top, while the clinker was drawn off at the bottom, at intervals. Among the well known kilns of this type were the Hoffmann ring kiln, the Dietsch and the Schoefer kilns. These kilns had the advantage of fuel economy, but they continued to require the briquetting of the raw meal and the sorting and reburning of the underburned clinker.

The Modern Shaft Kiln

With the modern high-efficiency shaft kiln the burning procedure is quite similar to that with the usual type of rotary kiln. The clinker is quickly burned and quickly cooled, through which its quality is influenced in an extremely favorable manner. The progress in this respect has made possible the character of product represented by the thin microscopic sections of clinker shown at *b* in Figure 2. This quality of clinker can be produced in a shaft kiln utilizing the principles developed in the high-efficiency kiln described in this article.

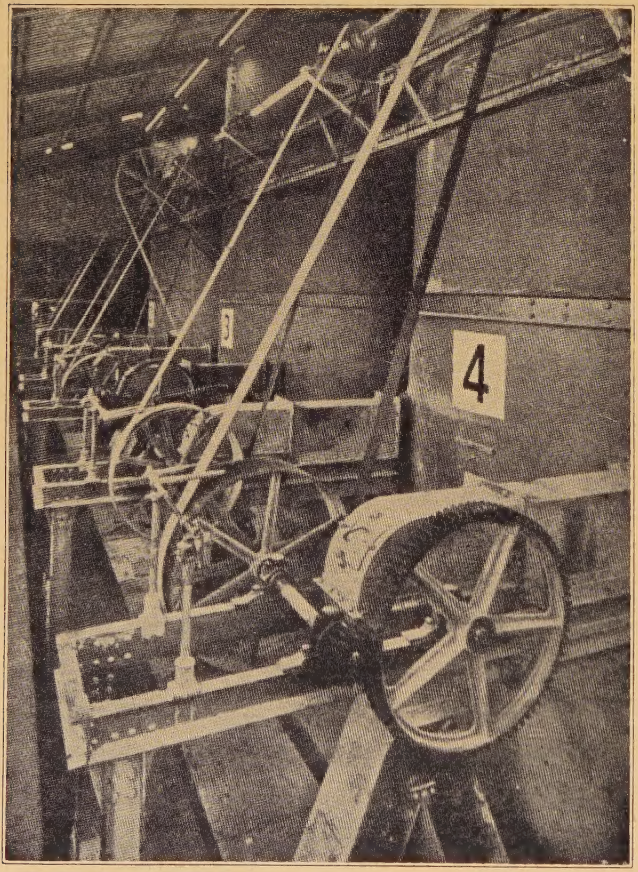

Figure 3. Raw meal and fuel are drawn from bins by double chain discharge

The Swiss Installation

The new plant at Hausen, Switzerland, built recently by the Portland Zementwerke Hausen, A. G., was described in the November (1931) issue of the *Cement Mill Edition* of CONCRETE,[1] pages 58-61. In this plant two shaft kilns were installed and provision was made for two more. In the same plant one rotary kiln of moderate length was installed and provision was made for one more. Reference to the plant plan, on page 59 of the article just mentioned, will disclose the great difference in the area of ground space occupied by the two types of kilns. The comparison, of course, is greatly favorable to the shaft kiln.

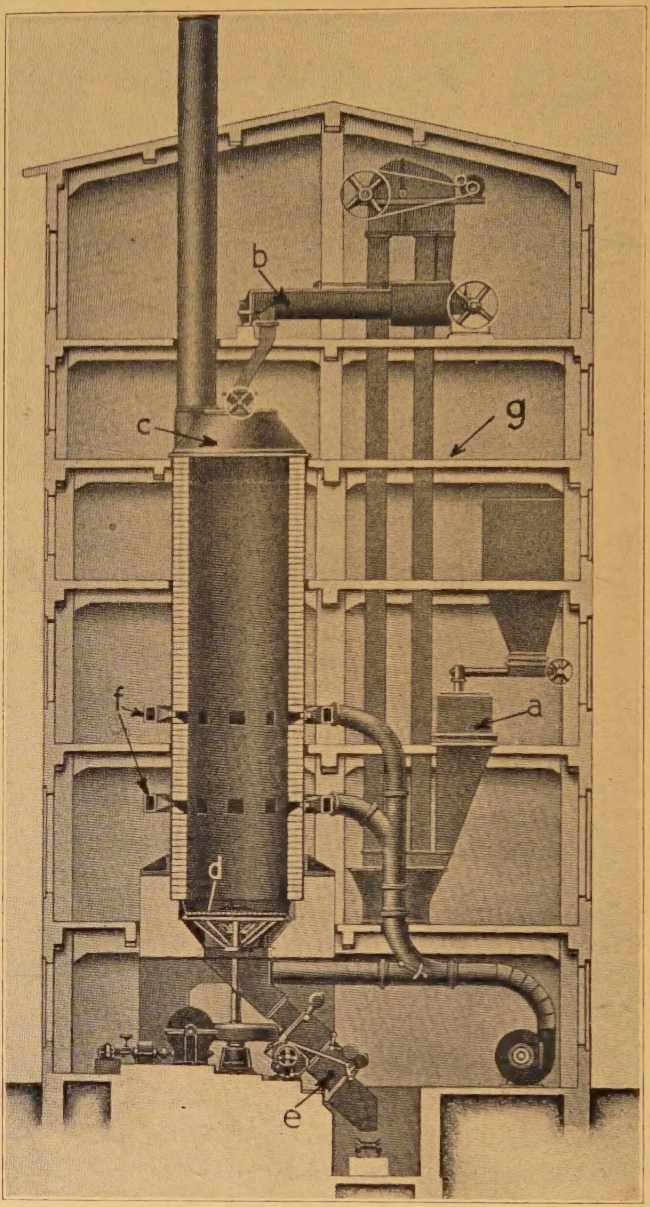

Figure 4. Modern high-efficiency shaft kiln installation. a. Raw meal and fuel weighing machines; b. Mixing and moistening worm equipment; c, Kiln hood and charging apparatus; d, Revolving grate; e, Discharge lock; f, Bustle pipe for combustion draft; g, Charging gallery

Returning now to the character of clinker produced in this modern shaft kiln, Figure 2 shows a comparison between the microscopic sections of clinker from an old type shaft kiln with briquetted raw meal (Figure 2a) and a similar section of clinker from the modern shaft kiln here described, from unbriquetted raw meal (Figure 2b). Observe the fine distribution of the clinker mineral particles and the liberal presence of the hydraulically active substance, which is similar throughout to the normal clinker from the rotary kiln (Figure 2c). This result is obtained by the regular working force. The operation is extremely simple and imposes little demand on the operators.

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[1] See also the October (1931) issue of the *Cement Mill Edition* of CONCRETE, pages 62-65.

The Principal Features of the Kiln

In the Swiss cement plant illustrated in Figure 1 the raw meal and fuel are drawn from the storage bins through automatically controlled special apparatus consisting of a double chain discharge, as shown in Figure 3, and weighed on two automatically coupled electrically activated weighing machines, an exact ratio being maintained. The weighing machines (at *a* in Figure 4) operate with extreme accuracy and permit adjustment to maintain the proper ratio.

Dry Mixing

A bucket elevator conveys the weighed mixture to a special mixing and moistening worm installed above the shaft kiln (at *b* in Figure 4). There the material is first mixed dry, and then thoroughly mixed with the addition of 10 to 12 per cent of water. The material comes out as a crumbly mass, which then falls through a descending tube onto the charging device over the shaft kiln, from which a movable chute distributes the material uniformly over the entire cross-section of the kiln (see point *c* in Figure 4). This procedure, in which the raw meal is utilized in unbriquetted form, not only saves the cost of a special briquette press, but it also prevents adhesion of the material to the kiln lining, which occurs in some types because of the irregular depositing of the material in the darting flame of the kiln.

Fuel Mixed With Raw Meal

In the kiln shaft the mixed-in fuel is burned with the raw meal, under the effect of the forced air draft coming in through the bustle pipes (at *f* in Figure 4) and through the revolving grate (at *d* in Figure 4), whereby the material becomes sintered. Also, under the influence of the secondary air draft coming in through the revolving grate, the clinker in the lower part of the kiln shaft is effectively cooled off. There is a rather narrow sintering zone, beneath which is the adjoining cooling zone. From this arrangement a very rapid passage of the contents of the kiln is obtained, the production capacity is large and the quality of the clinker is excellent. A daily capacity of 140 tons is obtained by one kiln shaft having a diameter of 8.2 ft. and a height of 32.8 ft.

How Underburning Is Avoided

Underburned material is almost entirely avoided, because of the carefully controlled forced air draft, which is introduced over the entire cross-section of the kiln.

Carrying of Clinker

The revolving grate that controls the draft to the kiln shaft (see *d* in Figure 4, and upper part of Figure 5) is built so sturdily as to insure against the development of fractures. It carries the burned and cooled clinker over the cross-section area of the kiln in a uniform manner without undergoing appreciable wear. Its driving pinion is located outside the kiln, where it is connected to an adjustable annular gear motor.

The Kiln Discharge

The kiln discharges through a funnel in the revolving grate, extending from the clinker to an airtight and dust-tight discharging lock (at *e* in Figure 4, and in Figure 5).

A high-powered fan supplies the forced air drafts for burning and cooling the clinker. Various recording devices and meters on the charging gallery (see *g* in Figure 4) make it possible to keep records of the kiln capacity and consumption.

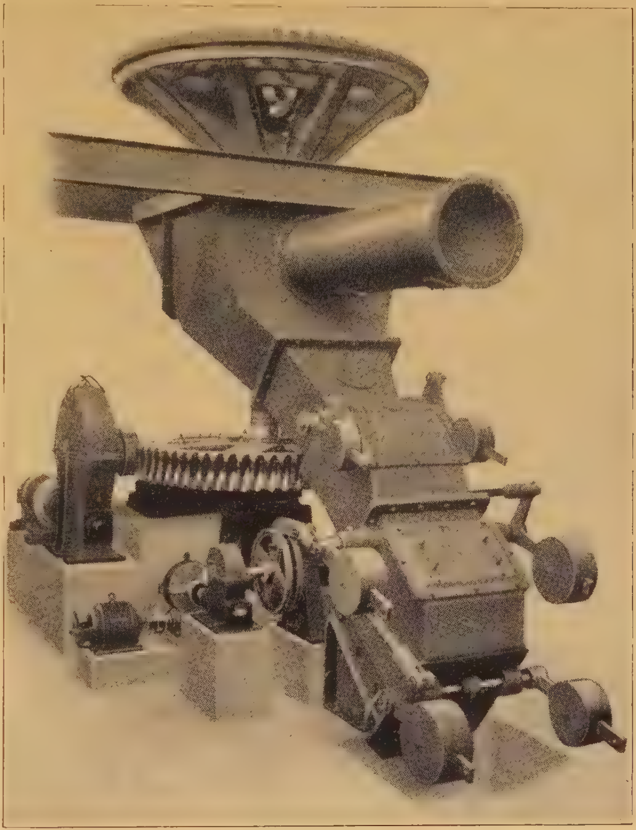

Figure 5. Kiln discharge apparatus, including a revolving grate (at top) and airtight and dust-tight discharging lock

Distinct Reduction in Cost

Under ordinary operating procedure the high-efficiency shaft kiln has equal advantages in the burning of both natural and portland cement. It has shown very good utilization of heat, and a distinct reduction of fuel consumption is realized. Both in fuel costs and in general factory costs the reduction is gratifying.

Acknowledgment

The shaft kiln installation here described was manufactured and installed by the Krupp-Grusonwerk-Andreas system, of Magdeburg, Germany, to whom CONCRETE is indebted for the technical description of the equipment.

Portland Cement Association Meets at Chicago

The Portland Cement Association met in its twenty-ninth annual convention at the Blackstone Hotel, Chicago, November 17 and 18. The various lines of activity followed by the industry were as usual considered by the standing committees.

A note of warning that funds collected from motorists to build concrete highways may be diverted to other purposes unless car owners resist such attempts was sounded by Frank H. Smith of New York, chairman of the board of directors, and president of the Lawrence Portland Cement Co.

At the closing session on Wednesday, Mr. Smith was re-elected chairman of the board, and Charles F. Conn of Philadelphia, president of the Giant Portland Cement Co., was elected treasurer. Newly elected directors include J. D. Johnson, president of the Canada Cement Co., Ltd., Montreal; John J. Porter, vice-president, North American Cement Corp., Albany, N. Y.; W. S. Speed, president, Louisville Cement Co., Louisville, Ky.; L. T. Sunderland, president, Ash Grove Lime and Portland Cement Co., Kansas City, Mo.; John Trainor, president, Riverside Cement Co., Los Angeles; and H. F. G. Wulf, president and general manager, Monarch Cement Co., Humboldt, Kans.

At the annual dinner on Wednesday evening, Edward J. Mehren presided as toastmaster and Hon. Henry Horner, judge of the Probate Court of Cook County, Ill., was the speaker of the evening.

Mississippi Company Venture Again Launched

Announcement of the organization of the Mississippi Portland Cement Co., at Columbus, Miss., first made in September, 1930, was repeated during November. Capital stock is placed at $1,500,000.

The plant, it is expected, will be located in Oktibbeha County, near Columbus, although locations in three other counties are also under consideration.

The organizers given are as follows: Andrew Fitzpatrick, New Orleans banker, who is president; J. M. Evans, Jackson, vice-president; Frank J. Duffey, Natchez, secretary-treasurer; George B. Hightower, Starkville; fiscal agent; W. W. Magruder, Starkville, general counsel; Mr. Fitzpatrick, Mr. Evans, Mr. Magruder, Mr. Dudley, B. R. Alford, New Orleans, and A. S. Nunez, New Orleans, directors.

"Most of the company's assets will be invested in the plant. Plans for the plant have not yet been completed. but it was understood it would be one of the largest in this territory and would have a heavy payroll."

Receivers Directing Consolidated Affairs at Three Plants

The business of the Consolidated Cement Corp. is now being directed by receivers at each of the company's three plants. Receivership action was taken on October 14, 15 and 16 in Michigan, Illinois, and Kansas, respectively. Albert B. Hoffman and Smith W. Storey have been appointed primary receivers in Michigan. Ancillary receivers appointed are Edwin D. Buell and Smith W. Storey in Illinois, and Smith W. Storey and Stanley G. Stewart in Kansas.

According to a stockholder's bankruptcy petition and request for receivership filed at Fort Scott, Kansas, the corporation lost $400,000 in the last two years and John L. Senior, president, has in the last five years caused directors to receive incorrect reports of income and expenses, spent excessively for marketing and paid excessive salaries to other officials.

Insolvency of British Cement Finance Firm Explained

In the compulsory liquidation of the British Cement Products & Finance Co., Ltd., the British financial enterprise which recently met with disaster, the official receiver has issued to the creditors and the stockholders a summary of the company's statement of affairs. It discloses gross liabilities of £904,626 ($4,523,130), of which £593,267 ($2,966,335) are expected to rank, and net assets of £21,154 ($105,770), with a total deficiency of £1,422,113 ($7,110,565) regarding the shareholders.

The concern's failure and insolvency are attributed to the financial conditions prevailing in the latter half of 1929, which made it impossible for it to fulfill its agreements to underwrite a public issue of 850,000 preference shares of Allied Cement Manufacturers, Ltd., and to the difficulties experienced by the latter combine, which were aggravated last year by acute competition in the cement industry.

W. D. Callender, Chicago Publisher, Passes Away

W. D. Callender, 60, publisher of *Rock Products*, *Concrete Products*, and other papers, died November 9. He was president of the Tradepress Publishing Corp., Chicago.

Death, following a cerebral hemorrhage, occurred at a hospital at Highland Park, Ill.

Mr. Callender had made his home at Naperville, Ill., a Chicago suburb. Funeral services and burial took place at New Brighton, N. Y., near his birthplace, Rensselaer.

International Cement Income Equals 83 Cents on Common

The International Cement Corp. reports for the September quarter a net income of $531,480 after depreciation, federal taxes and other charges, equivalent to 83 cents a share on 636,171 no-par shares of common stock outstanding at the end of the period.

Complete Waste Heat Installation at Marquette Plant

Installation of waste heat equipment at the Oglesby, Ill., plant of the Marquette Cement Manufacturing Co. was completed early in November.

It has not been definitely determined when the new equipment, which involved an expenditure of $250,000, will be placed in operation.

EDITORIAL

In Cents Per Barrel and Dollars Per Year

DURING the annual meeting of the Portland Cement Association an official of a cement manufacturing company took occasion to criticize the character of the information often presented in reports on laboratory and plant investigations dealing with cement manufacture.

Vast quantities of published reports and data of various other kinds have been made available to the industry, he said, which might have served a useful purpose, but which failed to hit the mark because they were not carried through to their logical conclusion. Many reports and papers of this nature, he continued, contain data of great value, but have not struck a responsive chord because the language and the figures mean little or nothing to the managing executives of the industry.

The managing executive must have more than scientific facts to work on, if he is to utilize the data developed in a scientific investigation. To be of practical value to him, the facts uncovered must be translated into usable information. What will it cost, for illustration, to make the changes and new installations in cement mill equipment necessary to put certain new processes or improvements into operation? What are the savings that may be expected?

In a word, the managing executive wants to know what it all means in cents per barrel and in dollars per year. The practical-minded investigator will present his data in that form.

The Mergers Are Coming

WHAT was undoubtedly an inspired newspaper article appeared in the New York Times of November 7, to the general effect that further mergers in the portland cement industry are in the offing.

The newspaper article, in the form of an interview with a high official of one of the largest groups in the cement industry, may be taken as a rather definite indication that additional mergers of some importance are soon to be announced.

This, as many believe, may be the ultimate solution to the major troubles that have beset the industry. Instead of eighty or more separate companies, as at present, there may be six or eight groups, much as we now see in the steel industry.

This may be the explanation of the real causes back of the price wars and other elements that have kept the industry in a turmoil for the last two years. This, too, may be the only way out.

Marketing Research

THE portland cement industry, or a part of it, is represented by an organization devoted to marketing research, mainly in the domestic field; but the industry as a whole has a long way to travel before it can be said that the field of marketing research is adequately covered.

In the domestic field enormous sums are wasted annually because of faulty methods of distribution and because of the competitive conditions that exist, and will in all probability continue to exist so long as the industry is represented by a large number of separately owned companies.

In the export field the market has not been developed at all in any large sense. It is a market that can not be exploited on the spur of the moment, after the need for foreign outlets has become a pressing one. It is to be hoped that study and patience may result in the development of this market for American portland cement, as it has been developed for other American manufactured products, so the cement plants located near the seaboard, at least, may enjoy the stabilizing influence of foreign markets.

Marketing research on a broad scale means the improvement of both merchandising and distribution methods. Here is where the cement industry is seriously handicapped, and it will continue to operate at a disadvantage until this neglected field is thoroughly cultivated.

We'll Have More Sense When This Is Over

"WE'LL all have more sense when this thing is over," said an experienced sales manager to the editor of "Concrete" not long ago.

"When business is back to its normal stride again," he continued, "we'll know enough to continue some of the economies that we have been compelled to inaugurate by force of circumstances.

"For one thing, we'll be more inclined to stay in the old office building where we have been established for many years, instead of scrambling for space in the newest and most luxurious skyscraper that the newspapers have been ballyhooing. We have learned, too, that not every one in the organization needs a private office, and that we might have conducted our business through all the fat years in 60 per cent of the office space we actually occupied."

This sales manager has cited only one of the many sources of waste that prevailed when the money was rolling in.

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Quarry Operations and Costs at Trinity Plant Near Dallas

Drilling and Blasting Methods—Loading and Transportation—Details of Crushing Plant Operation—Gas-Fired Dryers Reduce Moisture to One Per Cent

By J. WILLIAM GANSER[1]
Chief Chemist, Trinity Portland Cement Co., Dallas, Tex.

THE previous installment of this article described the geology of the rock formation and the physical and chemical characteristics of the "white rock" limestone quarried at the Trinity Portland Cement Company's plant near Dallas. The method of prospecting and exploration, and the practice followed in sampling, also are described.

Mining Methods

The lime rock, which is used only for portland cement, is quarried with 1 to 2 ft. of shale which lies directly beneath it. This rock and shale, with the additional shale which is quarried separately, amounts to 1,000 to 1,200 tons per day. By quarrying this amount six days a week it is never necessary to run the quarry on Sunday. The cut averages about 30 ft. wide and from 30 to 40 ft. high. The face now being worked is about 2,000 ft. long on land recently purchased, and is the farthest from the crushing plant, approximately 5,000 ft. away.

Drilling and Blasting

Primary drilling is done with a cyclone churn drill equipped with a 4-in. bit making a 4½-in. hole. This drill is electrically operated and is self-propelled on traction wheels by a 15-hp. variable-speed motor using 550-volt, 25-cycle current. Two men operate this drill, 10 hours a day, and normally drill 180 ft. The cost of drilling labor is 7 cents per ft.

The holes are drilled in two rows, the first 12 ft. from the face with holes 10 ft. apart, and the second 10 ft. back of the first row with holes also 10 ft. apart, and staggered 5 ft. off center from those in the first row.

The holes vary from 30 to 35 ft. deep, and are drilled to the shale. They are loaded so as to shatter the rock enough to pass through a 2½-yd. bucket. No rock is loaded from the teeth of the bucket, but often large rocks pass through the bucket and have to be gadded before being dumped into the crusher. Gadding is done with a pointed chisel about 8 in. long, made of 1-in. octagon tool steel. There are many times when this pointed chisel is driven 5 and 6 in. into the rock without splitting it. The only thing then to do is to pull out the gad and drive it into the rock somewhere else.

The usual custom is to shoot 20 to 25 holes simultaneously. When making the primary shots 4 by 8-in. 40 per cent gelatin dynamite is used, each hole requiring about 50 lb. of the explosive. Cordeau-Bickford is used on all primary shots, set off with a No. 6 detonator. About 80 per cent of the dynamite is placed in the bottom of the holes and the other 20 per cent is placed about one-third of the depth of the hole from the top. The holes are loaded in the usual manner and tamped with dirt by a wooden pole on a rope. It usually takes 10 to 15 men about three hours to load 20 holes.

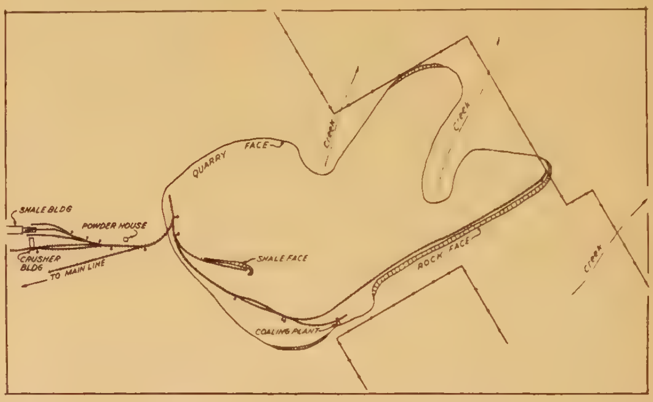

Figure 3. Quarry track layout

The primary shooting is done ahead of the shovel; that is, there is always a two or three weeks' supply of rock ready for it. Boulders that are too large for the rock crusher are not loaded into the cars but are laid aside for secondary shooting. The two men employed to do the secondary shooting bore a hole part way through each boulder by hand with a 1½-in. carpenter's nut auger welded into a ¾-in. pipe with a cross piece at one end. It is only necessary to use one-third to one-half stick of 40 per cent gelatin dynamite to shatter a boulder sufficiently. Fuses about 36 in. long are used in this secondary blasting.

Loading

All the lime rock at present is loaded by a No. 70 Marion steam shovel with a 2½-yd. dipper. This shovel, when bought, was of the railroad type; but several years ago the wheels and trucks were replaced with caterpillar traction. This change not only saved time in moving the

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Reprinted from U. S. Bureau of Mines Information Circular 6498.

[1] One of the consulting engineers, U. S. Bureau of Mines.

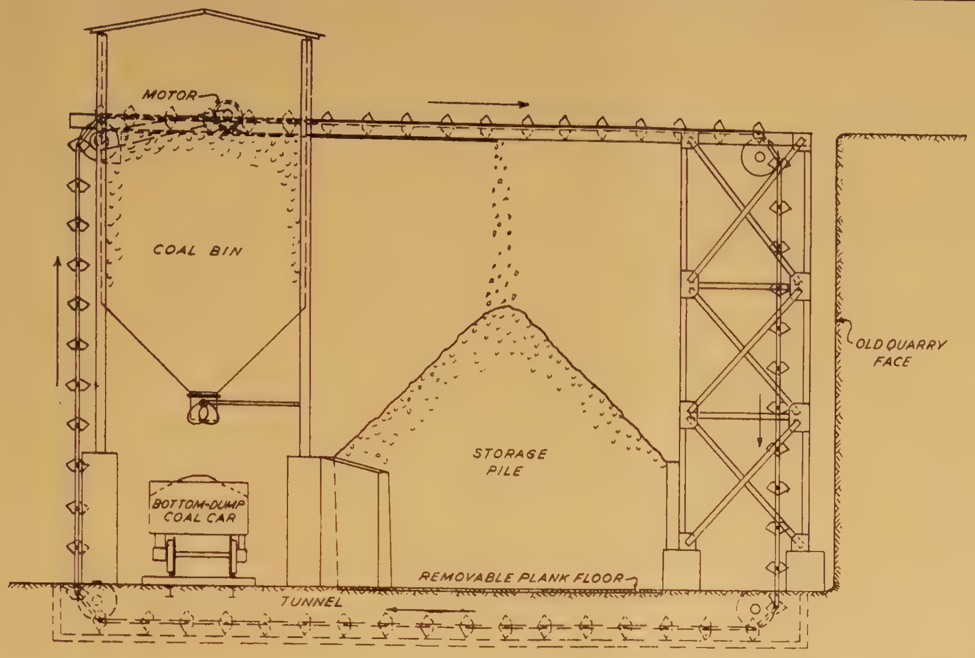


Figure 4. Quarry coaling plant

shovel, but it also allowed two men to be dropped from the pit crew.

The shale is quarried by an old No. 60 Marion steam shovel of railroad type which was used about 10 years ago to load lime rock. Since only 10 to 12 feet of shale is quarried it is never necessary to shoot it.

Transportation

All of the rock and shale is transported to the crushing plant, which is located at the mill, by two 35-ton Vulcan steam locomotives. One of these locomotives has been in operation since 1909 and the other since 1917. These locomotives each pull eight Oliver and Koppel 6-yd. side-dump cars, hauling a load of 65 tons of rock. The trains are limited to eight cars because of grades, which run as high as 5 per cent.

The quarry track is standard gauge. The only double track necessary is where the locomotives stop for water and where they pass each other near the crusher, as shown in Figure 3.

When hauling shale, only four cars are used, as the shale storage will accommodate only four carloads at one time. As only 10 to 12 per cent of shale need be added to the rock, it is only necessary to run the shale shovel at odd times; and when the shale storage is once full no shale is hauled from the quarry for several weeks.

Figure 4 shows a cross section of the coal storage. The coal hopper will hold about 100 tons and the outside storage about 500 tons. When a car of coal is unloaded the bucket elevator first fills the hopper and when it is full, carries the coal on by and discharges it on the outside storage. Coal for the locomotives and the shovels is drawn from the bottom of the hopper.

Crushing Plant

The flow sheet of the crushing plant is given in Figure 5. Coarse crushing is done by a 36 by 60-in. Allis-Chalmers Fairmount roll crusher, belt-driven by a 100-hp. 500-r.p.m. motor. (All motors at the Trinity plant are driven by 3-phase, 25-cycle, 550-volt current.) The capacity of this crusher is 250 tons per hour, but its output is limited by the capacity of the pan conveyor which handles its discharge, and of the hammer mill which follows it.

The rock coming from the roll crusher, about 6 to 8 in. in diameter, is carried by a short pan conveyor, driven by a 15-hp. 750-r.p.m. motor, to a No. 8 Williams hammer mill belt driven by a 150-hp., 500-r.p.m. motor.

The discharge from the Williams mill, which is about 1 in. and under in size, is conveyed by a 30-in. rubber belt, driven by a 25-hp., 750-r.p.m. motor, to the rock storage, which has a capacity of 8,000 tons. Rock is taken from this storage by a 24 by 32-in. McCaslin bucket conveyor which passes under the storage, through a tunnel, and delivers the rock to two bins which feed two 6 by 70-ft. gas-fired dryers. The conveyor is driven by a 10-hp., 750-r.p.m. motor.

The rock as it comes from the quarry contains 10 to 12 per cent moisture and, passing the Williams mill, has the following screen analysis:

Screen size passed	Per cent
1½-in.	100.00
1 -in.	90.3
¾-in.	78.7
⅜-in.	56.0
4-mesh	41.7
8-mesh	29.6
16-mesh	22.4
30-mesh	17.2
50-mesh	14.9
100-mesh	11.1

The dryers reduce the moisture content to about 1 per cent by burning 926 cu. ft. of natural gas per ton of rock, at a cost of 17.5 cents per 1,000 cu. ft. Figure 6 shows the details of the burner, which is made in our shops.

The rock from the two dryers is elevated by a bucket elevator and then conveyed by a screw conveyor to a bin which feeds six No. 8 Krupp ball mills, each belt driven

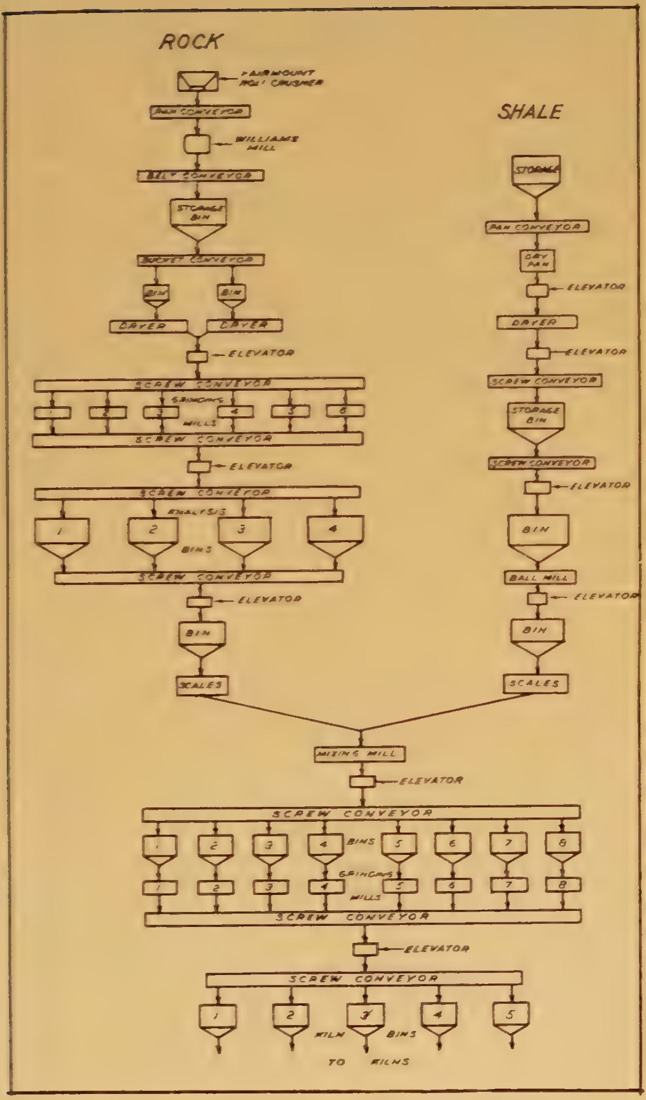


Figure 5. Flow sheet of the crushing plant

by a 50-hp., 500-r.p.m. motor. The elevator is of the centrifugal-discharge or continuous-bucket type. The buckets are made of 3/16-in. iron and hold about 1 cu. ft. each; that is, they are 20 in. wide, 17 in. deep, 12 in. wide at the top and taper to about ¼ in. These buckets are attached to two No. 844 manganese-steel chains. The elevator travels 150 ft. per minute, and has a capacity of 60 tons per hour. After being elevated, the rock is conveyed by 16-in. screw conveyors in unlined sheet-iron troughs. The repairs on the screw conveyors are minor, as the Austin chalk is not abrasive but has a soapy feeling. There are many sections of conveyors that have not been replaced for years. Replacements are only necessary when large pieces of scrap iron come from the quarry, and getting into the screw conveyor bend the flights so that they will not propel the rock along the trough.

The Krupp ball mills contain a charge of 4,800 lb. of 5-in. forged steel balls. The liners are manganese plates, none of which have ever had to be replaced from being worn out; the only replacements have been when one occasionally cracked. The wear on the steel balls is about 300 lb. per mill per year. The mills each have a capacity of 7 tons per hour and contain a load of about 800 lb. of limestone, the limestone remaining about 3½ minutes in the mill. The screen analysis of the ball mill discharge is as follows:

Screen size passed, mesh	Per cent
4	100.0
8	99.1
16	94.2
20	82.0
30	69.2
50	61.9
100	56.6

This material is then elevated by the same type of bucket elevator as previously described, and conveyed by screw conveyors, driven by a 25-hp., 750-r.p.m. motor, to four steel bins. These bins, each holding 84 tons, are filled one at a time and are emptied one at a time by a screw conveyor which feeds a bucket elevator driven by a 25-hp., 750-r.p.m. motor. The elevator delivers the ground rock to a bin from which it is drawn and weighed in 6-ton batches. Here the shale is added and the two materials are emptied into a 5 by 22-ft. mixing mill, belt-driven by a 50-hp., 500-r.p.m. motor.

From this mixing mill the material is elevated by a 20-in. bucket elevator, speed 150 ft. per minute, and conveyed by a 16-in. screw conveyor to 8 bins over the tube mills. This elevator and conveyor are both driven by a 25-hp., 750-r.p.m. motor.

Final Pulverizing

The final pulverizing is accomplished by eight 5 by 22-ft. tube mills, each belt-driven by a 150-hp., 500-r.p.m. motor. These mills discharge a "raw mix" with 90 per cent minus 200-mesh. The tube mills are loaded with 25

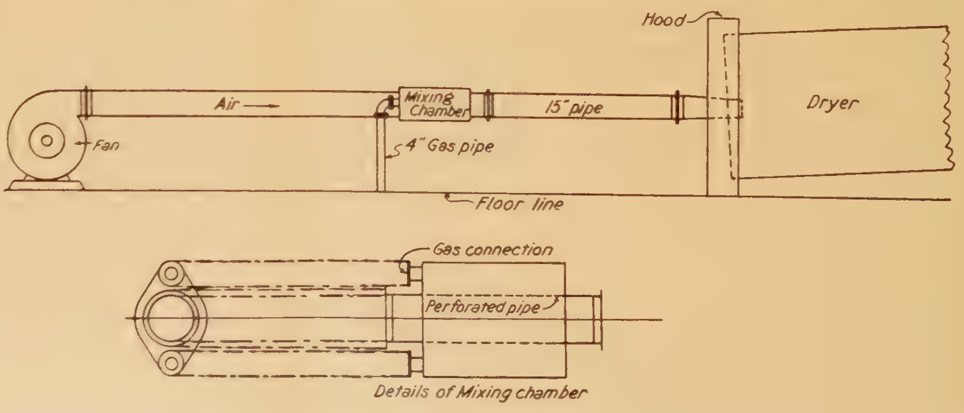


Figure 6. Gas burning apparatus for rock dryers

tons of slugs, 1 by 1½-in. chilled castings, which wear down at the rate of about 2 tons per year. The slugs about half fill the mill. The mill is fed from a hopper-bottom bin by a 6-in. screw conveyor. The speed of this screw conveyor has been determined by experiment so as to regulate the feed to give the required fineness of ground product. The discharge from the tube mills is elevated to five bins, and fed to five kilns, where it is burned at 2,800 deg. F.

Crushing the Shale

The shale is crushed in a dry pan to about ½-in. size and under. This dry pan is a pulverizer commonly used at clay plants and is a horizontal, revolving table, 8 ft. in diameter, with sides about 1 ft. high. The center 4 ft. of the table is of solid steel, and the outer 2 ft. is made of cast plates in which are 9/16 by 4-in. slots. Two steel rolls, each weighing 1 ton, crush the shale as it passes between the rolls and the revolving plate. The fines pass through the slots and the coarse particles are pushed back again under the rolls to be crushed. In feeding the dry pan the shale is spouted so that it falls under the rolls. The dry pan is belt-driven by a 50-hp., 500-r.p.m. motor; and the dryer and elevators are driven by two 25-hp. motors, belted in tandem to one pulley.

The shale, after being dried, is elevated to a storage bin holding 4,000 tons. The shale at this point has the following screen analysis:

Screen size passed	Per cent
1-in.	100.0
¾-in.	98.7
⅜-in.	94.9
4-mesh	87.2
8-mesh	73.3
16-mesh	55.7
30-mesh	34.2
50-mesh	22.0
100-mesh	11.6

From storage the shale is drawn into a tunnel, conveyed by a 12-in. screw conveyor to a bucket elevator, and lifted to a small bin. It is next slightly pulverized in a small ball mill driven by a 15-hp., 750-r.p.m. motor. This ball mill was originally put in to catch the spikes and track bolts coming with the shale from the quarry. The mill contains about 400 pounds of 1 and 2-in. balls that have been worn down in the rock ball mills. From this ball mill the shale is conveyed to the scale, where it is weighed and added to the limestone. The following is the screen analysis of the shale from the ball mill:

Screen size passed	Per cent
¾-in.	100.0
⅜-in.	97.3
4-mesh	89.5
8-mesh	75.7
16-mesh	59.4
30-mesh	34.4
50-mesh	26.5
100-mesh	19.3

(Wage scales, safety measures and summaries of costs will be included in the final installment of this article, in the next issue.)

The Relation of Labor Turnover to the Accident Curve

Plant with Poor Safety Record Made Trophy Winner—Immediate Effect on Labor Turnover

By W. L. WHITE, JR.
**Assistant General Manager, Medusa Portland Cement Co.,
Cleveland, Ohio**

The experience of the Medusa Portland Cement Company has been that a very definite relationship exists between safety and labor turnover and resulting plant efficiency. The word safety is used in its psychological rather than its mechanical or educational sense.

There are four groups of people who must co-operate in order to insure good safety practice:

(1) Company executives and officials.
(2) Plant managers and superintendents.
(3) Members of plant safety committee.
(4) Individual employees.

Unless there is 100 per cent co-operation among these four groups, good safety records will not be attained. I do not mean that the labor turnover will be reduced to nothing even if a perfect safety record be attained, but the improvement will be marked by contrast.

Building Up a Trophy Winner

In 1928 attention was called by the Portland Cement Association to the fact that one of our plants had an extremely poor accident record. It was one of the lowest of the low twenty-five reporting to the association and had a high loss in hours through lost-time accidents and fatalities.

About 250 men are employed there and because the accident record of this plant was far below that of other plants of the company, the officials were naturally very much concerned about it. Thinking that if the competitive spirit could be aroused conditions would improve, they constantly emphasized the poor showing that the plant was making when compared with other mills. This did little or no good. The safety committee continued to function in a more or less desultory manner, as it had for years, and very little honest-to-goodness safety work was being accomplished. During this period, as you will see from the figures given later, the plant had a very high percentage of labor turnover.

In 1929 it was decided to try entirely new tactics. A safety director was employed who had under his jurisdiction all the plants of the company. His was a personal contact, man to man, and the positive, encouraging attitude was taken rather than the negative, discouraging attitude. New life and pep were put into the safety committee and they were told to forget past failures and to look ahead to what could be accomplished. Employees were urged to offer suggestions for additional mechanical safeguards and these suggestions were carried out wherever possible. An extensive educational program through means of bulletins and posters was carried on, and, in short, every effort was made to give them a new outlook on the situation.

In August, 1929, this plant made a complete right-about-face. The safety movement gained ground rapidly and the next year, 1930, the plant was awarded a safety trophy by the Portland Cement Association.

Labor Turnover as an Indicator

The labor turnover percentages for the Medusa organization for the years 1929 and 1930 are as follows:

	1930	1929
Bay Bridge	1.45	1.31
Dixon	37.0	103.0
Toledo	20.3	45.0
York Gray	-----	4.5
Wampum	12.9	12.0
Manitowoc	2.67	- -
Newago		- -
York White	7.8	12.1

While the labor turnover at Dixon was reduced but 8 per cent in 1929, you will note that it was reduced 66 per cent in 1930, and this is attributed entirely to the effect of safety, inasmuch as there was no change in the plant management.

It is a poor rule that does not work both ways and that applies to labor turnover and safety.

A case can be cited where the labor turnover was extremely high and the safety movement carried on in a rather haphazard manner. A change in plant management was made and efforts were immediately directed to reorganization of personnel, which was of the utmost importance. This took a long time to bring about, but it was finally accomplished and it was found that the increase in labor efficiency brought about a decrease in labor turnover, a corresponding increase in plant efficiency and consequent reduction in cost.

Where there was anything but a smooth-running organization prior to the change in plant management, after this change was effected and a suitable force of employes built up, the organization was as smooth-running as a clock and the lost-time accidents and accident severity rating were reduced to a minimum. It is only reasonable to expect that accidents will occur with greater frequency where the worker's knowledge of the machinery and its operation is limited.

Old Plants with Good Records

Then there is the "old" plant which might be termed a dangerous place to work. Two instances of this sort come to mind; one of a plant built in 1892, the other in 1901, both removed from industrial centers that might affect the labor turnover over a long period of time. Plant management has not been changed frequently and a stabilized force has been built up, the son often taking the place of the father. Labor turnover has been consistently low with correspondingly low accident frequency.

Results in safety work cannot be secured in a short time and the worse the record of the plant is, the longer it is going to take to clear it up. Missionary work, perseverance, patience, education, are all part of the program and there are many discouragements, but the results to be secured more than repay all the effort put into the work.

As you know, every plant of this company won a trophy in 1929 or 1930, and you will see from the labor turnover table given that safety has a large bearing on labor turnover, and vice versa.

Trophy Awarded New York Alpha Plant Is Dedicated

Representing the reward for several years' determined effort on the part of the plant personnel, the cast stone safety trophy awarded by the Portland Cement Association for a perfect accident record for the year 1930 was unveiled with fitting ceremonies at the Alpha Portland Cement Company plant at Cementon, N. Y., on Thursday afternoon, October 15. The entire town turned out to join in the celebration, including all school children. About 700 persons were present, surrounding the trophy which had been placed in the center of a green parkway on the plant grounds.

E. C. Sandt, plant chemist, presided at the dedication and introduced L. E. Andrews, assistant engineer of the Portland Cement Association in New York, who in a congratulatory address presented the trophy to the plant. The monument was unveiled by the Misses Pearl and Juanita Ziegler, daughters of Daniel Ziegler, plant engineer and one of the most active members of the plant safety committee.

The trophy was accepted by Edward M. Flanagan, foreman of the machine shop.

G. S. Brown, president of the Alpha Portland Cement Company, was then introduced by Mr. Sandt as one of the outstanding safety boosters of the cement industry.

After Mr. Brown's message to his employes, Mr. Sandt then introduced the following other honorary guests: Mr. McKelvy, vice-president of the company; N. D. Colburn, general superintendent of the company and former superintendent of the Catskill plant; Mr. Hamilton, the company's safety director; Arch Brown, superintendent of the Catskill plant; Daniel Ziegler, chairman of its safety committee, and Dr. Mahlon H. Atkinson, company physician.

John Dowling, member of the division of industrial hygiene of the New York State Department of Labor, addressed the gathering on "Safety Always." He was followed by the Rev. Clarence E. Brown, pastor of the First Baptist Church, Catskill, N. Y., who made an inspirational talk on accident prevention.

The program was concluded with the singing of the national anthem by the gathering, and the Rev. S. M. Mountz, pastor of St. Paul's Lutheran Church at West Camp, N. Y., gave the benediction.

After the formal ceremonies were over the company furnished the assemblage with refreshments, during which a program of entertainment was presented by plant workers.

Texas September Shipments Exceed Production; Make New Record

A 15 per cent increase in shipments in September over the corresponding month in 1930 is reported for Texas by the Bureau of Business Research of the University of Texas. The total, 688,000 barrels, is the highest for any September on record.

Shipments exceeded production for September by 10 per cent, and stocks were reduced to the lowest amount since the close of October, 1929, according to the report.

Presented before cement section, Twentieth Annual Safety Congress, Chicago, October 12-16, 1931.

Effect of Containers and Storage on Properties of Cement

Strength Affected Less Than Rate of Hardening—Employ Four Types of Container—Practically No Deterioration With Air-Tight Storage

By **D. A. G. REID, B.Sc.**
Building Research Station, Watford (England)

DURING the last few years there has been a growing demand for information on the effect of storage on the qualities of modern cements. This paper is a preliminary note on work in progress at the Building Research Station on this subject. The investigation deals largely with the effect of storage conditions on the rate of hardening of cements, particularly rapid-hardening cements. The work is not yet complete, but from the tests already made it is possible to draw certain general conclusions of sufficient interest to warrant publication. A complete report will be issued at a later date and it is possible that the results of experiments may reveal facts which will necessitate slight amplifications, or modifications of the statements made here.

Scope of Investigations

The factors investigated are set out in the following list:

(A) *Type of Cement.*—(*a*) Normal Portland, (*b*) Rapid-hardening portland, (*c*) Aluminous.

(B) *Type of Container.*—(*a*) Jute sack, (*b*) Four-ply paper sack, (*c*) Wooden keg, (*d*) Metal drum.

(C) *Condition of Storage.*—(*a*) Closed shed storage at normal temperatures, (*b*) Cold storage at —10 deg. C., (*c*) Oven storage +70 deg. C.

(D) *Period of Storage.*—A standard period of storage of three months has been taken throughout, with additional periods up to two years in some instances.

The conditions of storage were selected to represent conditions which might actually occur in practice. The shed storage, in a closed timber shed, may be regarded as typical of a contractor's cement store. The oven storage, the temperature of which was controlled by thermostat within a range of a few degrees Centigrade, is representative of the extreme form of hot storage, as, for example, in the hold of a ship. The cold storage, actually in a local ice factory, was taken as an extreme form of what might happen to cement stored during a hard winter.

Subsequent to the various periods of storage, portions of the cement were set aside and, after aeration in trays in layers about 2 in. deep for periods of about one month, were tested in the usual manner. Before sampling, each container or each tray was emptied on to a bankerboard and thoroughly mixed by hand.

Conclusions Developed

The general conclusions that may be drawn from the results of the tests are as follows:

Loss on Ignition.—For all types of cement tested, and all containers used except the metal drum, the loss on ignition has been found to increase as a result of storage. The effect appears, in fact, to be equivalent to a slow aeration process, and aeration for a comparatively short time in an open tray will produce results similar to those obtained by storing cement for much longer periods in a non-air-tight container. Increase in loss on ignition seems a fair guide to the deterioration of the cement during storage. Provided the loss on ignition is less than 2 per cent, the portland cement examined was not found to be seriously damaged by aeration. This figure is conservative and it is probable that the loss on ignition may increase nearly to 4 per cent for a rapid-hardening portland cement before the rapidity of hardening is seriously affected. An aluminous cement will frequently show a gain and not a loss on ignition due to the oxidization of ferrous iron. This gain on ignition decreases during storage, but only very slowly. The deterioration in the cement is correspondingly slow.

Appearance.—After the severe types of storage (e.g., the jute and paper sacks in the shed) the cement appeared coarser to the touch, and in some cases air-set lumps were formed.

Water Requirements for Standard Consistency.—The amount of water required to make up a neat cement paste of standard consistency rose steadily with increasing loss on ignition.

Fineness.—There appeared to be no change in the fineness of the cement except where the residue on a No. 180 sieve was increased by the presence of air-set lumps. The flour content, as determined by an air separator, remained stationary for all samples.

Setting Time.—The setting time of cement was not always affected in the same manner or to the same extent by storage. For example, in the case of aluminous cement it appeared that the setting time lengthened, the final setting time for some samples increasing from 6 hr. to 11 hr. Portland cement samples stored in the oven developed a flash set which did not disappear until the cement had undergone several months' further aeration in open trays. Aluminous cement stored in the oven did not develop this flash set. Portland cements stored in metal drums in the oven did not develop a flash set during actual storage, but when the cement was taken from the drum and exposed to the air it developed a flash set within 3 days. The setting times of the other samples of portland cement seemed to fluctuate during aeration without having a definite trend in either direction.

From *Cement and Cement Manufacture*, March, 1931.

Specific Gravity.—The specific gravity of all samples appeared to decrease as the loss on ignition increased, and these changes were roughly proportional.

Strength.—There seems to be no doubt that the ultimate effect of storage is not so much a deterioration of the strength developed in the concrete as a decrease in the rate of attaining that strength. The tensile strength of neat cement appeared more sensitive to this change than the tensile strength of 1:3 sand mortar. The compressive strength of concrete also appeared more sensitive than the mortar tensile strength.

Containers Compared.—With regard to the type of container tested, from the point of view of the protection afforded to the cement there seems to be little to choose between the four-ply paper sack and the jute sack. The wooden keg seems rather better than either of these, and the air-tight metal drum is definitely best of all. If cement be stored in air-tight drums, then for all practical purposes it does not alter and may be used with confidence even if it has been in the drum for more than a year. The more easily the atmosphere may reach the cement, the more quickly the cement will deteriorate for all purposes.

It is worthy of note that ordinary jute and paper sacks and even wooden kegs were not capable of withstanding a temperature as high as 70 deg. C. for any length of time. The sacks split and the fabric became so friable that it was difficult to remove them from the oven; the hoops fell off the kegs and the wood staves fell apart as soon as the kegs were disturbed. In the case of the rapid-hardening portland cement the disintegration of the paper sack took place within a week of its being placed in the oven.

Work is now in progress to determine the relative influence of the various factors which take part in the process of aeration and at the same time to enable a reliable estimate to be made of the permissible increase in loss on ignition.

Incompatibility Between Aluminous and Portland Cements

Accelerating Effect on Rapidity of Setting Believed Due to Presence of Free Lime

It is known that the addition of portland cement to high-alumina cement has as a consequence the production of a cement of very rapid setting qualities. The study of mixtures of various quantities of portland cement has shown that the rapidity of setting at first increases until the quantity of portland cement is 70 per cent, after which it decreases progressively. These results are even more pronounced when one replaces the normal portland cement with some under-burned cement. One may conclude from these experiences that the accelerating effect of portland cements or hydraulic mortars on high-alumina cement is not due to the essential constituents of the cements added, but to the free lime already existing or formed through the hydration of calcium silicate. This hypothesis has been confirmed elsewhere through some experiments with the addition of free lime to high-alumina cement.

Microscopic examination has led to the following interpretation: The hydration of high-alumina cement is accomplished in this manner:

$$2(CaO.Al_2O_3) + 11\ H_2O = 2\ CaO.Al_2O_3,\ 8\ H_2O + 2\ Al\ (OH)_3.$$

This reaction is reversible and rather slow; it does not become quickened until after a certain length of time. The hydration of a high-alumina cement to which lime has been added occurs in accordance with the following equation:

$$2\ CaO.Al_2O_3,\ 8\ H_2O = CaO,\ Al_2O_3 + Ca(OH)_2 + 7\ H_2O.$$

This reaction is not reversible and is very rapid. Contrary to that which occurs with pure high-alumina cements, the rapidity of setting diminishes with the elapsed time.

These facts explain the accelerating effect of the addition of portland cements on the rapidity of setting of aluminous cements.—Koga Kuschi and K. Koyanagi, in *Zement*, Sept. 11, 1930.

Study of Decomposition of Cement Tricalcium Silicate

It has long been known that portland cement, if heated to 1,000 deg. C. or higher, often deteriorates in its hydraulic properties. This is due to the liberation of lime, which if present to any great extent in the uncombined state causes unsoundness. Earlier studies have shown that the lime is liberated from the tricalcium silicate, which is one of the major constituents of portland cement.

In the course of the present study it was found that at temperatures between 1,000 deg. and 1,300 deg. C., tricalcium silicate decomposes quite readily. The rate of decomposition is about fifteen times as great at 1,175 deg., its maximum point, as it is at 1,000 deg. Above 1,175 deg. the rate decreases rapidly, and at 1,300 deg. the decomposition is negligible. The presence of either of the products of the decomposition, dicalcium silicate and free lime, accelerates the reaction. For this reason, tricalcium silicate which has been exposed to moist air decomposes much more readily than that which has been freshly prepared, since the moisture of the air reacts with the silicate, liberating lime. The presence of gypsum also accelerates the decomposition, probably because the gypsum dissociates and liberates lime.—*From Technical News Bulletin No.* 173, *National Bureau of Standards, Washington, D. C., Sept.*, 1931.

Utah Plant and Quarry Reopen on Full-Time Basis

The plant and quarry in Salt Lake City and Salt Lake County, respectively, of the Portland Cement Company of Utah resumed operations in October following a shutdown since July.

Work is being found for 100 men on a full-time basis and without a reduction in their former wages.

60,000-Bbl. Order Recalls Men to Dewey Plant

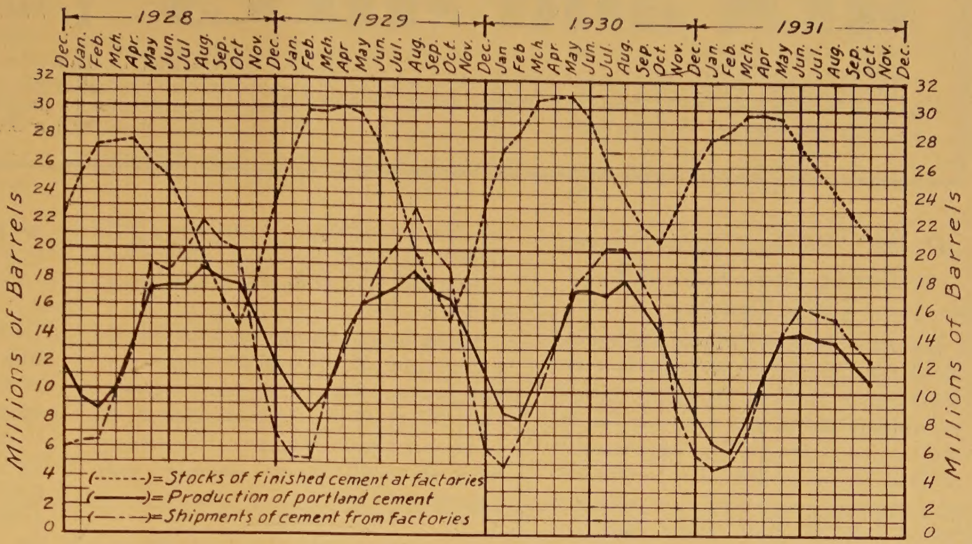
Awarding of a contract for 60,000 bbls. of cement during October to the Dewey Portland Cement Co. resulted in the re-employment of several hundred men at the plant at Bartlesville, Okla.

Cement Statistics for October

Decrease in October Shipments Less Than for Previous Three Months

Relation of Production to Capacity

	The Month, Per Cent	The Twelve Months, Per Cent
October, 1931	47.4	**48.6**
October, 1930	**65.4**	64.2
September, 1931	55.3	50.2
August, 1931	60.2	52.0
July, 1931	62.0	53.8



	1930	1931	Increase or Decrease, %
Production, October	**14,410,000**	10,762,000	—25.3
Shipments, August	**15,599,000**	12,360,000	—20.8
Stocks at end of month	20,697,000	**21,138,000**	2.1

	1930	1931	Increase or Decrease, %
Total production for yr.	**126,917,000**	110,435,000	—27.9
Total shipments for yr.	**144,272,000**	115,167,000	—25.2
No. of plants reporting	165	165	

Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in October, 1930 and 1931, and Stocks in September, 1931

District	Production—October		Shipments—October		Stocks at end of month		Stocks at end of September, 1931*
	1930	1931	1930	1931	1930	1931	
Eastern Pa., N. J. and Md.	**2,793,000**	2,369,000	**3,535,000**	3,123,000	4,255,000	**4,668,000**	5,422,000
New York and Maine	**1,220,000**	1,110,000	1,201,000	**1,231,000**	1,088,000	**1,159,000**	1,281,000
Ohio, Western Pa. and W. Va.	**1,655,000**	904,000	**1,704,000**	1,139,000	3,030,000	**3,109,000**	3,344,000
Michigan	**1,130,000**	602,000	**1,093,000**	616,000	**2,317,000**	1,893,000	1,908,000
Wis., Ill., Ind. and Ky.	**1,938,000**	1,337,000	**2,115,000**	1,662,000	**2,546,000**	2,324,000	2,648,000
Va., Tenn., Ala., Ga., Fla. and La.	**1,132,000**	1,009,000	**1,248,000**	1,050,000	**1,697,000**	1,684,000	1,725,000
Eastern Mo., Ia., Minn. and S. Dak.	**1,591,000**	975,000	**1,618,000**	995,000	1,542,000	**2,341,000**	2,361,000
W. Mo., Nebr., Kans., Okla. and Ark.	**957,000**	795,000	**947,000**	881,000	**1,652,000**	1,219,000	1,305,000
Texas	484,000	**601,000**	469,000	**583,000**	**721,000**	558,000	539,000
Colo., Mont., Utah, Wyo. and Idaho	**134,000**	117,000	**227,000**	185,000	414,000	**474,000**	541,000
California	**953,000**	698,000	**1,006,000**	662,000	963,000	**1,085,000**	1,050,000
Oregon and Washington	**423,000**	245,000	**436,000**	233,000	472,000	**624,000**	612,000
	14,410,000	10,762,000	**15,599,000**	12,360,000	20,697,000	**21,138,000**	22,736,000

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1930 and 1931

Month	—Production—		—Shipments—		Stocks at end of month	
	1930	1931	1930	1931	1930	1931
January	**8,498,000**	6,595,000	**4,955,000**	4,692,000	27,081,000	**27,759,000**
February	**8,162,000**	5,920,000	**7,012,000**	5,074,000	28,249,000	**28,612,000**
March	**11,225,000**	8,245,000	**8,826,000**	7,192,000	**30,648,000**	29,676,000
April	**13,521,000**	11,245,000	**13,340,000**	11,184,000	**30,867,000**	29,715,000
May	**17,249,000**	14,010,000	**17,224,000**	14,200,000	**30,891,000**	29,554,000
June	**17,239,000**	14,118,000	**18,781,000**	16,077,000	**29,364,000**	27,602,000
July	**17,078,000**	13,899,000	**20,153,000**	15,545,000	**26,289,000**	25,934,000
August	**17,821,000**	13,549,000	**20,299,000**	15,172,000	23,824,000	**24,313,000**
September	**16,124,000**	12,092,000	**18,083,000**	13,671,000	21,889,000	***22,736,000**
October	**14,410,000**	10,762,000	**15,599,000**	12,360,000	20,697,000	**21,138,000**
November	11,098,000	....	8,784,000	....	23,056,000	....
December	8,480,000	....	5,688,000	....	25,838,000	....
	160,905,000	....	158,744,000	....	....	....

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*Revised.

Blacker type indicates larger of two figures.

MEN and MILLS

[Mill News for the Men in Other Mills]

Readers, even though not regular contributors, are invited to send in news notes about themselves or their fellow workers or about the "doings" in their mills.

We are glad to have men in the mills use this page as a clearing house for all kinds of news that is of interest to the men in other mills—to promote the comradeship that already exists among those who make portland cement.

R. M. Willson Supervises Tests on Hoover Dam Cement

Supervised by R. M. Willson, chief chemist of the Victorville, Calif., plant of the Southwestern Portland Cement Co., initial experiments of cement to be used in the construction of Hoover dam were made at the plant on November 6. This was the first of a series of conferences to be held and was attended by other cement plant and government chemists of the Southwest.

At an earlier meeting held at Denver, Colo., several weeks previous, it was decided to conduct all experiments at the Southwestern plant.

Those present included W. S. Trueblood, head chemist of the Monolith cement plant at Tehachapi; Wilson Hanna and a party of three representatives from the California Portland Cement Co. of Colton; Hubert Wood and several representatives from the Riverside Portland Cement Co., and Prof. Raymond E. Davis of the engineering department of the University of California at Berkeley.

Kanengeifer, New Wellston Co. Head, Inspects Ohio Plant

On October 4, F. R. Kanengeifer, who the first of the month assumed the position of president of the Wellston (Ohio) Iron Furnace Company, made his first inspection of the Superior, Ohio, cement plant, operated by the Wellston company.

The new president, who has had considerable experience in the cement and brick paving industries, was very much impressed with the Lawrence county plant.

Mr. Kanengeifer was formerly vice-president and general manager of the Bessemer Limestone & Cement Co. of Youngstown, Ohio, and an active member and director in the Portland Cement Association and the National Crushed Stone Association. He was likewise vice-president of the Metropolitan Paving Brick Co., Youngstown.

Superior Plant Organizes Boy Scout Troop

For the first time in the history of the Superior, Ohio, cement plant a Boy Scout troop is being organized among the sons of the employes.

George Henry, of the plant office force, will head the troop as scoutmaster, being assisted by Roy Miller, a high school student and son of Robert Miller, repairman.

Arrangements for the organization are in the hands of a committee composed of Vint Gustin, Wifco department foreman; Fred "Ted" Besco, chemist, and A. B. Claar, commissary manager. The work is being sponsored by the Methodist Episcopal church.

A. W. King Resigns as Cowham Service Manager

Effective December 1, A. W. King has resigned as manager of the service department of the Cowham Engineering Co., Chicago. The action was necessitated by a reduction in personnel caused by receivership action affecting the Consolidated Cement Corp., associated with the Cowham System.

Mr. King joined the Cowham System in May, 1929, when its service department was established. He was previously associated, for two years, with the structural and technical bureau of the Portland Cement Association.

Mr. King has also had extensive publication and editorial experience, having written or prepared scientific papers, articles for the technical press, promotive technical literature, and advertising and sales matter.

Prior to his connection with the Portland Cement Association, he was in charge of the materials testing laboratory of the Bureau of Science, Manila, Philippine Islands, for 10 years, during which period he was appointed professor of civil engineering in the College of Engineering, University of the Philippines. Later he joined the Kalman Floor Co. as sales engineer, a position he left to engage in technical research and promotive work for the Atlas Lumnite Cement Co.

Thomas Harte Succeeds Boeye as North American Executive

Thomas J. Harte has been elected vice-president and general sales manager of the North American Cement Corporation, Albany, N. Y. He succeeds the late Fred A. Boeye whose death occurred October 3.

Mr. Harte was formerly associated with Mr. Boeye in the training and handling of the sales organization.

Wellston Offices to Be Located at Portsmouth, Ohio

Removal of the offices of the Wellston Iron Furnace Co. from Jackson to Portsmouth, Ohio, is expected to take place early in December.

Arrangements have been practically completed and the greater part of the personnel now employed by the firm in Jackson will go to Portsmouth at that time. The latter city, it is stated, is somewhat more centrally located in the sales territory, is equally convenient to the plant at Superior, Ohio, and offers other advantages.

Headquarters for the company have been maintained in Jackson for more than a decade. At first the company operated blast furnaces at Wellston, and following a decline in that business, obtained control of the local cement plant and continued to operate under the old name.

Purkhiser Appointed Chairman of Church Commission

H. H. Purkhiser, superintendent of work at the Lehigh plant at Mitchell, Ind., has been appointed as chairman of the business men's commission of the Indiana Christian Missionary Association.

The commission's purpose is to inspire churchmen to a greater interest in all phases of church work.

J. B. Zook Heads Safety Council Program Committee

J. B. Zook of Buffalo, N. Y., was elected chairman of the program committee of the Cement Section for the 1932 convention of the National Safety Council, at the annual meeting at Chicago in October.

Mr. Zook is chief engineer and chairman of the safety committee of the Great Lakes Portland Cement Corporation.

Catlin Succeeds Smith on Missouri Board

David Catlin, St. Louis capitalist, has been elected a member of the board of directors of the Missouri Portland Cement Co., to succeed the late J. Sheppard Smith, president of the Mississippi Valley Trust Co.

F. E. Sheward Recovering After Operation

F. E. Sheward of Jackson, Ohio, sales manager for the Wellston Iron Furnace Co., operating the Superior, Ohio, cement plant, is recovering from an appendicitis operation at a Gallipolis, Ohio, hospital.

Doane of Lehigh Joins Marketing House

Roland D. Doane, for several years advertising and sales promotion manager of the Lehigh Portland Cement Co., has joined the organization of Taylor, Rogers & Bliss, Inc., as director of its dealer service division.

Mr. Doane's long and close contact with building material dealers has given him a knowledge of the problems of manufacturers who distribute through these channels, and an understanding of the dealer's own selling and business requirements.

Taylor, Rogers & Bliss, Inc., with offices in New York and Chicago, is an organization devoted to market analysis and sales development in the building industry.

Alpha Cuts Capital Stock $6,000,000

The Alpha Portland Cement Co., a New Jersey corporation, was authorized by the secretary of state on November 13 to decrease its capital stock from $26,134,500 to $20,486,000.

Widow Follows Chapin Day in Death

Mrs. Day, widow of Chapin A. Day, president of the Utah-Idaho Portland Cement Company who died on October 16, has just passed away in the Good Samaritan Hospital in Los Angeles, Calif., following an illness of one week from pneumonia.

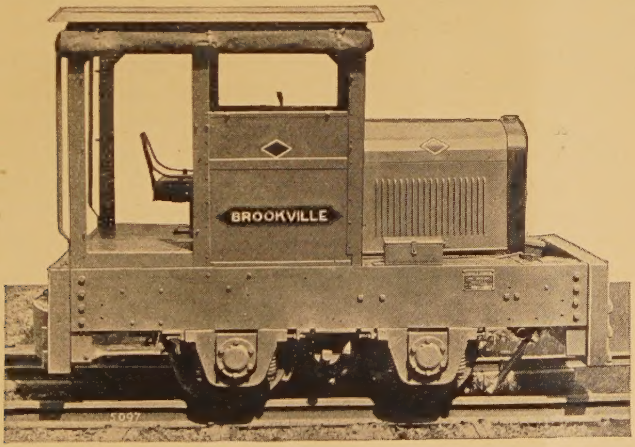
Mrs. Day was stricken with a cold while attending the funeral services of her husband which developed into pneumonia.

She was the mother of Mrs. Bristol, wife of Ralph E. Bristol, general manager of the cement company headed by his late father-in-law, and had reached the age of 81. She was born in Chicago.

Mill Equipment

New Brookville Locomotive Carries Guarantee

Announcement is made by the Brookville Locomotive Co., Brookville, Pa., of a locomotive that carries what is said to be an unusual guarantee which should mean a great deal to the user. Certain features which definitely account for superior performance are also pointed out by the manufacturer. The unit is equipped with a Ford Model "AA" power plant.



The guarantee offered is as follows: The chassis, running gear and all other of the Brookville parts in the "BFA" are absolutely guaranteed against breakage or failure due to inferior parts, faulty workmanship or ordinary wear for a period of six months; with the exception of injury by accident or misuse.

The features of construction, according to the Brookville company, are as follows:

(1) Dual spring journal wheel suspension, permitting use over rough, crooked tracks.

(2) Steel tires, providing 25 per cent greater traction.

(3) Four speed reverse, providing four speeds in either direction, up to 16 miles per hour. The Brookville gear reverse employs high-grade spiral bevel gears, Timken bearing equipped and operating under an oil bath in a dustproof housing.

(4) Governor control to protect motor.

(5) Air cleaner for carburetor.

(6) Timken bearings at wheel journals and in the reverse gearing.

(7) Three pocket link and pin coupler.

(8) Self starter.

(9) Half-length steel cab, newly designed, of sturdy heavy gauge sheet steel construction supported by steel angles and fitted with roll curtains for full enclosure.

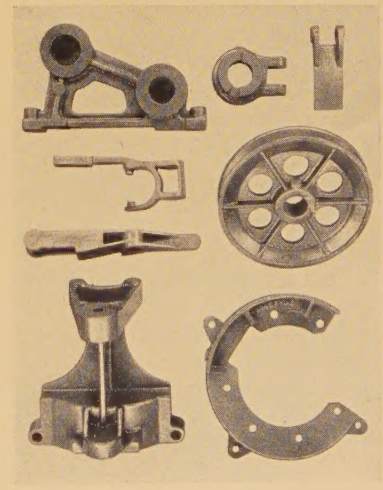
These models are offered in 2, 2½, 3, 3½ and 4 tons weight for any gauge of track.

Industrial Castings One of New Uses of Promal

When the Link-Belt Company first introduced its Promal metal about four years ago, it was purely as a component of its own chain products. Its field of usefulness has widened, however, and today Promal is claimed to be finding a strong demand from manufacturers of standard equipment, for use in parts here and there in their products.

Promal's characteristics are as follows, according to the Link-Belt Company:

It is a specially processed malleable iron, the process employed transforming it into a material of radically different microstructure and physical properties. That it is truly a new and different metal has been recognized by the patent office, as patents have been allowed Link-Belt Company not only on the material itself but on the proc-



ess of producing it is as well. The name, Promal, is a registered trademark.

Promal can be repeatedly heated to a maximum of 1,000 deg. and cooled without affecting its physical properties. It has a uniform structure throughout its cross section, and its resistance to wear and abrasion continues after the surface is worn off.

Its physical properties are given as follows:

Yield point	50,000 lbs. per sq. in.
Ultimate strength	70,000 lbs. per sq. in.
Fatigue strength	33,000 lbs. per sq. in.
Elongation	10 to 14 per cent in 2 in.
Modulus of elasticity	26,000,000
Coefficient of thermal expansion	.0000109 in.
Electrical conductivity	211 ohms per mil. ft.
Magnetic permeability	79 at 200 ampere turns
Specific gravity	7.35
Average brinell hardness	170 to 190

The yield point, a most important property of any metal used in a load-carrying capacity, is exceptionally high in Promal, indicating its ability to withstand heavy loads without permanent distortion. This property, combined with Promal's high fatigue strength and elongation, indicates that it will not only withstand these high loads once, but a countless number of times, without failure.

Copper bearing Promal can be readily supplied where exceptional corrosion resistant properties are desired. By the addition of suitable alloying elements, Promal can be supplied with exceptionally high physical properties and wear values. Ultimate strengths up to 100,000 pounds per square inch, with a yield point of 75,000 pounds per square inch and 10 per cent elongation in 2 inches, are possible under these conditions.

Promal is made at Link-Belt Company's Ewart works, Indianapolis, where facilities have been increased to take care of the demand aside from the company's Promal chain requirements.

About the Manufacturers of Equipment

Industrial Literature

Traylor Type TZ Reduction Crusher

The Traylor Engineering & Manufacturing Co., Allentown, Pa., has issued a new 14-page *Bulletin No.* 1110, superseding No. 110, and containing detailed specifications and an illustrated description of the Traylor Type TZ reduction crusher.

This crusher is said to be a modern breaker that successfully meets the following five major demands of users:

1. Great capacity at relatively small power expenditure, and low maintenance cost.
2. Large receiving opening and reduction ratio.
3. Small, uniformly-sized product with low percentage of oversize.
4. Wide range of adjustment for product size, and a simple means of making the adjustments.
5. Adaptability to service in any material.

The TZ crusher is of the gyratory type and is said to utilize an entirely new principle in the design of the crushing head and concaves, which makes possible much greater capacity to smaller than the former standard minimum product size, at considerably less cost per ton for horsepower and metal consumed. The new head and concaves are built into the well known, time proved Bulldog patented design, and combine the features of that machine with those peculiarly their own, all of which may be summarized briefly as follows:

1. A straight line, bar type, non-weaving spider.
2. A self-tightening, auto-locking and non-stripping suspension nut.
3. A stocky, non-deflecting main shaft.
4. A lower shaft sleeve which constitutes a self-aligning feature and eliminates wear of the main shaft.
5. An extremely long eccentric of extra large diameter, working at low unit pressure.
6. Cast steel gearing with accurately machine cut teeth.
7. A dust sealing device which does not fail to keep all foreign matter outside of the lubrication chamber.
8. A positive, automatic lubrication system with all elements contained in an oil-tight, dust-proof chamber.
9. A design of crushing head and concaves which—
   - A. Affords greater receiving openings than any other cone type secondary reduction machine.
   - B. Eliminates all possibility of choking.
   - C. Provides a greater ratio of reduction and makes possible greater capacity at smaller-than-usual-setting.
   - D. Reduces the percentage of oversize.
10. A design of suspension which enables the operator to adjust the crushing head for changing product size, in a range of fifty per cent from maximum or minimum setting, downward or upward.
11. Applicability of the TZ design of head and concaves to any type or make of gyratory crusher, at reasonable cost.
12. In either the straight TZ type, or crushers converted by installing the TZ crushing head and concaves, lowest-cost-per-ton is attained, for power, metal consumed and general maintenance.
13. Adaptability to efficient service in any material.

Amsco Pump

The *Amsco Type C* materials handling pump is covered in a 4-page loose-leaf folder issued by the *American Manganese Steel Co.*, Chicago Heights, Ill.

G-E Capacitors

Among the recent publications of the *General Electric Co.*, Schenectady, N. Y., is a 20-page publication, *"Capacitors for Power-Factor Correction."*

This is publication *GEA-77D*, superseding *GEA-77C*.

Another new publication is that on the CD type of recording instruments, for alternating and direct current, bound and punched for binding. This is *GEA-1061D*, superseding the "C" of the same prefix.

Fairfield Skip Hoists

Skip hoists manufactured by the *Fairfield Engineering Co.*, Marion, Ohio, are covered in a 4-page folder including chiefly

Fairfield hoists are built in capacities of from 5 to 300 tons per hour, with bucket sizes from 10 to 150 cu. ft. and with bucket speeds ranging from 50 to 300 ft. per minute.

Manganese Steel Screen Bulletin

The economy of Rol-Man double lock mesh manganese steel screens for revolving equipment is the subject of *Bulletin 230*, recently issued by the *Manganese Steel Forge Co.*, Philadelphia, Pa.

The booklet outlines and illustrates the advantages of Rol-Man screens, and gives detailed information regarding methods of application to various types of revolving equipment.

The Traylorian

The Traylorian is a new publication containing "Some News, Some Views and Some Foolishness," its first issue now being distributed by the Traylor Engineering & Mfg. Co., Allentown, Pa.

This first number is dedicated to *Samuel W. Traylor, Sr.*, chairman of the board and founder of the company.